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THE PHILIPPINE AGRICULTURIST

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The Philippine Agriculturist

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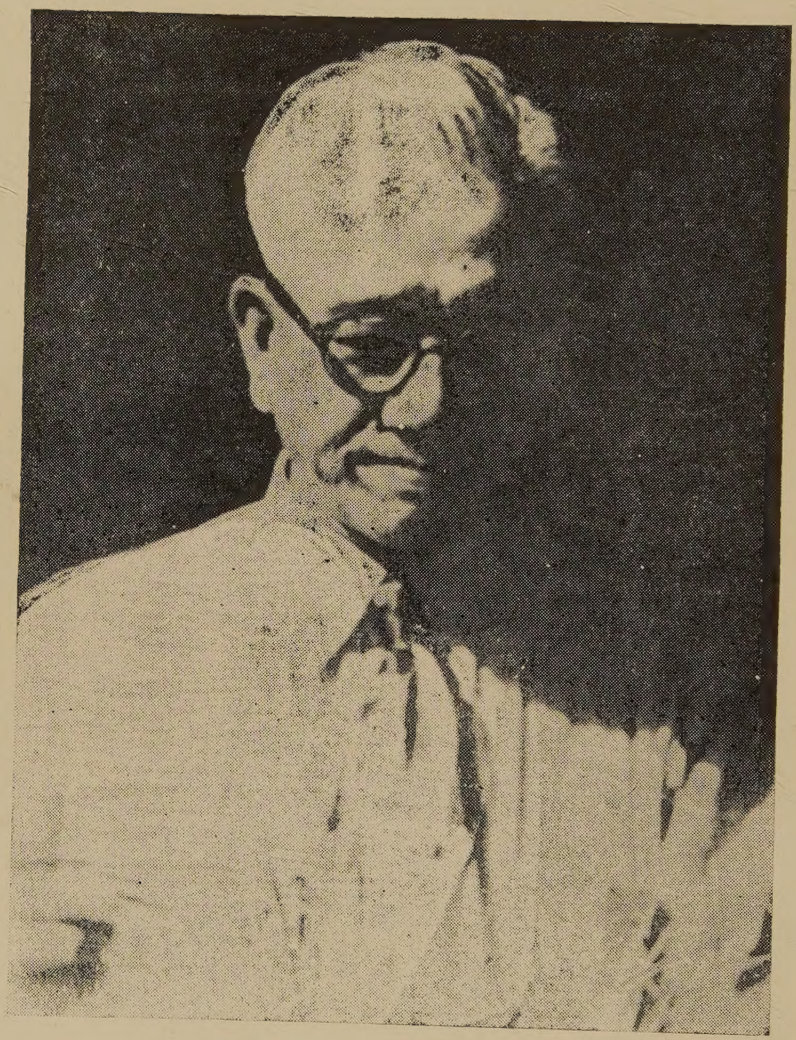

RAFAEL B. ESPINO, PH.D.
1890–1951

RAFAEL B. ESPINO, 1890-1951 [1]

In the sudden death of Dr. Rafael B. Espino on May 18, 1951, Philippine science lost a pioneer in the field of crop physiology, and the College of Agriculture, University of the Philippines, at Los Baños, a ranking faculty member. At the time of his death he was professor and head of the Department of Agricultural Botany.

Doctor Espino was born on October 24, 1890, in Samal Bataan; son of Daniel and Engracia (de los Reyes) Espino. He received his early education at the Liceo de Manila. Continuing his studies at the College of Agriculture, he graduated with the degree of Bachelor of Agriculture in 1915. Immediately after graduation he was appointed graduate assistant in botany. In 1917 he was awarded a fellowship by the University of the Philippines. He studied at the University of Chicago in the summer of 1917 and finished graduate work in plant physiology at Johns Hopkins University, where he obtained his Ph. D. degree in 1919, under the late American plant physiologist, Dr. Burton Edward Livingston.

Upon his return to the Philippines, he held positions first in the department of agronomy and later in the department of agricultural botany. He served as instructor in agronomy, 1919-1920; assistant professor of agronomy, 1920; assistant professor of plant physiology, 1920-1924; associate professor of plant physiology, 1924-1929; professor of plant physiology, 1929-1937; acting head, department of plant physiology, 1924-1928; head of the department of agricultural botany, 1928-1937; professor of agricultural botany and head of the department, 1937 to the time of his death. He was exchange professor at Lingnan University, Canton, China, in 1935. He held the José F. Zamora professor of plant physiology during the academic year, 1948-1949. He served as consulting fiber technologist of the Bureau of Agriculture in 1922. His latest assignment was in the special committee created by the Secretary of Agriculture and Natural Resources for the control of abacá mosaic and cadang-cadang of coconut.

Doctor Espino was a member of various scientific organizations and honor societies: National Research Council of the Philippines (Charter member); Society for the Advancement of Research; Los Baños Biological Club (president, 1927); Phi Kappa Phi; Philippine Society of Technical Agriculturists; Philippine Society of Agronomists. He served as associate editor for botany in the *Philippine Journal of Science* since 1925, and as a member of the advisory board of *The Philippine Agriculturist* since 1927.

During the 36 years of service with the College of Agriculture, Doctor Espino made contributions in his chosen field of research.

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[1] General Contribution No. 853.

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His main line of work was in plant physiology, particularly mineral or inorganic nutrition of crop plants. His earlier scientific contributions were on the anatomy and tensile strengths of fibers of different varieties of abacá (*Musa textilis* Née). A great number of his publications published singly or in joint authorship with his colleagues and associates deal with salt requirements, culture solutions, growth and development, foliar transpiration, germination, photoperiodism, and fertilizing value of volcano ash on crop plants. The number of titles credited to him at his death are: scientific contributions—39; popular or semi-popular articles—20; and scientific articles prepared under his directions—36.

This brief sketch of Doctor Espino would be incomplete without any reference to his personality. He always had the courage of his convictions and did not hesitate to advocate any action he considered right or condemn any he thought wrong however unpopular his position might be. This trait sometimes got him into academic disputations with his colleagues, but he maintained his stand on controversial issues on a high professorial level. At times, he might have been impulsive in expressing his points of view, but he was ready to accept rectifications when his arguments were proved less acceptable.

In 1913, while still an undergraduate at the College of Agriculture, he married Eliza Baenziger. Four children were born to them Romeo, Arturo, Gustavo, and Norma, all of whom are married. His eldest son, Romeo, is a holder of B. S. Agr. and M. S. Agr. degrees from the University of the Philippines. His wife, the four children, and a number of grandchildren survived him.

LIST OF BOTANICAL WRITINGS OF RAFAEL B. ESPINO

Scientific publications

1915. Abacá fiber. Philippine Agriculturist and Forester 4: 200–216.
1916. Some phycomycetous diseases of cultivated plants in the Philippines. Philippine Agriculturist 5: 65–71. (With Nemesio Mendiola).
1919. Mineral nutrition of plants. Plant World 22: 53–54.
1919. A review of coconut investigations at the College of Agriculture. Philippine Agriculturist 8: 161–178.
1919. A review of maize investigations at the College of Agriculture. Philippine Agriculturist 8: 191–197.
1920. Cotton. Philippine Agricultural Review 13: 186–210. *Graph.*
1920. A preliminary study on the mineral nutrition of young cotton plants. Philippine Agriculturist 8: 335–343.
1920. Some aspects of the salt requirements of young rice plants. Philippine Journal of Science 16: 455–525.
1922. Mineral salt requirements of rice. Philippine Agriculturist 10: 313–319.
1923. On the germination of coconuts. Philippine Agriculturist 11: 191–200.
1923. A study on the germination of abacá seeds. Philippine Agriculturist 12: 101–109. (With L. G. Ferrer).
1923. Absorption of complete culture solutions by abacá roots with reference to growth of branch roots. Philippine Agriculturist 12: 111–119. (With S. M. Cruz).

1923. Soil moisture requirements of young abacá plants. Philippine Agriculturist **12**: 121–126. (With P. Hernais).

1923. A preliminary study of the salt and fertilizer needs of the young abacá plant. Philippine Agriculturist **12**: 127–133. (With B. O. Viado).

1923. Foliar transpiring power of different varieties of abacá grown at the College of Agriculture. Philippine Agriculturist **12**: 135–140. (With Perpetuo Gavarra).

1923. Comparative study of fibers produced by six varieties of abacá when grown in Los Baños. Philippine Agriculturist **12**: 141–151. (With Felix Esguerra).

1923. Comparative study of fibers produced by six varieties of abacá when grown in Los Baños: II. Philippine Agriculturist **12**: 153–164. (With José Chico Reyes).

1923. Comparisons of forty-seven varieties of abacá grown under Los Baños conditions. Philippine Agriculturist **12**: 165–170. (With Teofilo Novero).

1923. Mauritius hemp (*Furcroea gigantea*) with reference to its inferiority to abacá, maguey, and sisal. Philippine Agricultural Review **16**: 108–119. (With T. Novero).

1923. Character and usefulness of fibers from petioles of buri palm with measurement of the tensile strength of the fibers. Philippine Agricultural Review **16**: 287–298. (With G. C. Zabella).

1924. Absorption of culture solutions by coco-palm roots. Philippine Journal of Science **25**: 51–73. (With José B. Juliano).

1924. The abacá industry of the Philippine Islands. World Agriculture **4**: 300.

1925. Tentative score card for judging coconut plantation. Annual Report of the Dean, College of Agriculture 1924–1925: 112–114.

1928. Growth and development of young rice plants as influenced by the food in the seed. Philippine Agriculturist **16**: 597–601.

1928. Report on recuperative growths within a year of some plants injured by a typhoon. Philippine Agriculturist **17**: 89–93.

1931. Influence of light upon growth and development of plants with special reference to the comparative effects of the morning light and the afternoon light. Philippine Agriculturist **19**: 563–579. (With F. Pantaleon).

1931. A critical study of the nutritive values of nitrate nitrogen for young rice plants. Philippine Agriculturist **20**: 27–42. (With Roman P. Estioko).

1931. Tolerance of young rice plants to relatively large amounts of magnesium sulfate contained in complete culture solution. Philippine Agriculturist **20**: 269–287. (With Eleuterio Palisoc).

1934. Harmful effects upon young rice and maize plants of rice straw when added to clay loam soil in pots. Philippine Agriculturist **22**: 534–556. (With F. T. Pantaleon).

1935. Effect of heat upon the viability of buñga (*Aeginetia indica* Linn.) seed. Philippine Agriculturist **24**: 439–450. (With F. T. Pantaleon).

1935. Plant physiology as foundation of scientific agriculture. Lingnan Biology Seminar Reports, p. 61-67- Lingnan University, Canton, China.

1936. Construction of mushroom beds in the Canton region. Philippine Agriculturist **24**: 752–762.

1939. Studies on the fertilizing value of Mayon Volcano ash: I. Effects upon plants of liberal application of the volcanic ash. Philippine Agriculturist **28**: 133–142.

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1940. Effects upon the carbon-nitrogen ratio in leaves of rice grown in Lipa clay loam supplied with varying amounts of ammonium sulfate. Philippine Agriculturist **29**: 34–47 (With William Crocker).

1941. Studies on the fertilizing value of Mayon Volcano ash: III. Effects upon growth, development, and yield of upland rice. Philippine Agriculturist 29: 797–811. (With Manuel C. Agda).
1947. Eleven years' study on "buñga ñg tubo": A resumé. Philippine Agriculturist 31: 151–153.
1948. Effects of photoperiod upon upland rice plant variety Inintiw. Philippine Agriculturist 31: 256–270. (With Burton T. Oñate).
1948. Effects of 2,4-D on some common plants. Philippine Agriculturist 32: 60–64.

Popular or semi popular articles

1929. Department of Plant Physiology. Philippine Agriculturist 18: 359–365.
1931. As science is remaking the world so the graduates will assume leadership. Philippines Herald, April 11, 1931.
1934. A quarter century of research activity in the Department of Plant Physiology. Philippine Agriculturist 23: 403–415.
1934. Consultation on farm problems. Agricultural Life 1: 23–24.
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1935. Plant physiology and ecology. National Research Council of the Philippines Bull. 5: 414–424. (Annual Report 1934–1935).
1935. Farming in South China. Agricultural Life 2: 14, 33.
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1936. The Lingnan non-collegiate school of agriculture. Agricultural Life 3: 9, 11.
1937. What plants get from the soil. Philippines Herald Mid-Week Magazine (March 3, 1937), p. 16.
1937. More on soil possibilities. Philippines Herald Mid-Week Magazine (March 17, 1937), p. 15.
1937. What do plants get from the soil? Agricultural Life 4: 26–27.
1937. Other materials which the green plants absorb from the soil. Agricultural Life 4: 30–31, 40.
1937. The romance of adding manures and fertilizers to soil. Agricultural Life 4: 7, 36.
1938. Maintenance of soil fertility. Progressive Farming 2: 9, 18, 42. *Also in* Agricultural Life 5: 26, 67.
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1939. A review: "Growing plants without soil." Philippine Agriculturist 28: 601–603.
1939. Commercial fertilizers used in various sugar centrals in the Philippines. Progressive Farming 3: 12–14, 16, 18, 20, 22, 24, 32, 36–37. *Also in* Agricultural Life 6: 13, 15, 32, 38, 13, 39, 41–43.
1940. Ways by which the yield of crops may be predicted. Agricultural–Commercial–Industrial Life 7: 11, 23.

Scientific articles prepared under the direction of Dr. Espino

1922. Effect of time of planting on growth and yield of a lowland rice in Peñaranda, Nueva Ecija and on the College farm. Philippine Agriculturist 10: 381–392. By Ambrosio P. Abesamis. (Dr. F. T. McLean, earlier adviser).
1926. Comparative amount of gases carbon dioxide, oxygen, and nitrogen in the body of certain plants. Philippine Agriculturist 14: 557–567. By Sixto A. Gaerlan. (Prof. D. A. Herbert, earlier adviser).
1928. Effects upon rice plants of changing the moisture content of soil. Philippine Agriculturist 27: 173–185. By Feliciano T. Pantaleon.

1929. Comparative nutritive values of different salts of ammonium. Philippine Agriculturist **17**: 37–43. With illustrations. By Eleuterio Palisoc.

1929. Studies of the germination of vegetable seeds. Philippine Agriculturist **17**: 451–463. By Gaudencio A. Ventura.

1929. Effect on young rice plants of adding aluminum salts to complete culture solutions. Philippine Agriculturist **17**: 607–625. By Felix Villa.

1929. Comparative nutritive value of water obtained from different sources, with determination of the nutritive deficiencies of Molawin creek water for young rice plants. Philippine Agriculturist **18**: 39–64. By Servillano G. Gutierrez.

1930. The relative effects of different iron salts upon growth and development of young rice plants. Philippine Agriculturist **19**: 43–52. By Felix G. Gines.

1931. Comparative development of roots of rice plants grown in pots containing ammonium sulfate fertilizers of different amounts. Philippine Agriculturist **20**: 121–137. By Pablo P. Libatique.

1931. Weeds in rice paddies: Germination of seeds and resistance of the young plants to submergence in water. Philippine Agriculturist **20**: 217–231. By Marcelino B. Garcia.

1931. A study of the salt requirements of coco-seedling grown in pots. Philippine Agriculturist **20**: 352–361. By Gregorio R. Briones.

1932. Influence of the depth of preparation of the soil on the growth and development of sugar cane plant, var. Luzon White with special reference to the yield of roots. Philippine Agriculturist **20**: 606–616. By Numeriano L. Cuevas.

1932. Comparative effects upon young rice plants of different nitrate salts in complete culture solutions. Philippine Agriculturist **21**: 127–139. By Baldomero G. Salinas.

1934. Effects on the growth and development of sugar cane plant of bagasse when added to soil in pots. Philippine Agriculturist **22**: 707–803. By Artemio P. Malabayabas.

1934. Influence of amount of fertilizer added to soil on growth of rice plants and on composition of its leaves. Philippine Agriculturist **23**: 295–316. By Mariano F. Soriano.

1934. Effects of fertilizers on the growth and development of young lanzon plants (*Lansium domesticum* Correa). Philippine Agriculturist **23**: 613–638. By Cornelio O. Mariano.

1935. A study of the salt requirements of the young sugar cane plants with special reference to its nitrogen requirements. Philippine Agriculturist **23**: 789–809. By Rafael T. David.

1935. An experimental survey of the relative nutritive value to young coconut palm of fertilizers added to tuff soil in pots. Philippine Agriculturist **24**: 152–165. By Valeriano O. Valenoba.

1935. A study of the effects upon growth and development of an upland rice of varying the moisture content of soil in pots. Philippine Agriculturist **24**: 393–412. By Guillermo O. Palis.

1936. A study of the N-P_2O_5-K_2O ratio for an upland rice (*Oryza sativa* L. var. *Inintiw*) when grown in tuff soil in pots. Philippine Agriculturist **24**: 678–699. By Mariano S. Macasaet.

1936. A study of the formation and nitrogen content of root tubercles of cowpea. Philippine Agriculturist **25**: 168–190. By Manuel L. Dinglasan.

1936. Effects upon sugar-cane plants of varying the moisture content of clay loam soil in pots. Philippine Agriculturist **25**: 266–283. By Bartolome P. Javier.

1937. Effects on dry matter and ash content of rice plants by varying the amounts of ammonium sulfate. Philippine Agriculturist **26**: 446–474. By Virgilio T. Almeda.

1938. Should potassium sulfate be added with ammonium sulfate to Lipa clay loam for upland rice? Philippine Agriculturist **27**: 148–167. By Pablo C. Enrile.

1938. Should superphosphate be added with ammonium sulfate to Lipa clay loam for upland rice? Philippine Agriculturist **27**: 284–301. By Benigno G. Talamisan.

1938. Determination of the fertilizer and fertilizer mixture suitable for an upland rice. Philippine Agriculturist **27**: 471–494. By Democrito Topacio.

1938. Moisture content of clay loam at the time of wilting of rice plants at different ages. Philippine Agriculturist **27**: 530–547. By Leoncia L. Serrano.

1939. Effects of varying amounts of ammonium sulfate on moisture content of Lipa clay loam wilting of rice. Philippine Agriculturist **28**: 321–337. By Felipe R. Lopez.

1941. Fertilizer studies with onion grown on Lipa clay loam on pots. Philippine Agriculturist **29**: 772–790. By Antonio C. Bello.

1941. Effects of certain crytotropic elements upon the growth and yield of upland rice. Philippine Agriculturist **29**: 833–850. By Esteban Y. Castillo.

1941. Determination of fertilizer requirements of corn plant when grown in Lipa clay loam. Philippine Agriculturist **29**: 877–891. By José Madrigal, Jr.

1941. Effects of varying amounts of ammonium sulfate upon yield, rate of maturity, and size of grain of rice grown on clay loam. Philippine Agriculturist **30**: 17–30. By Lusanandana Bhakdi.

1941. Addition of potassium sulfate and superphosphate with ammonium sulfate to Lipa clay loam for upland rice. Philippine Agriculturist **30**: 136–144. By Tomas G. Cabotage.

1941. Some aspects of the salt requirements of rice plants during vegetative stage. Philippine Agriculturist **30**: 251–299. By Hsieh Feng Yuan.

1941. Studies on the fertilizing value of Mayon Volcano ash. IV. Effects upon growth and development of abacá plants. Philippine Agriculturist **30**: 401–420. By Vicente C. Ureta.

1941. Studies on the fertilizing value of Mayon Volcano ash. V. Effects upon the growth and yield of soybean. Philippine Agriculturist **30**: 500–513. By Kwock Kee Pang.

JOSÉ M. CAPINPIN
Of the Department of Agricultural Botany

A STUDY OF ELEMENTARY SCHOOL GRADUATES IN ILOCOS SUR, WITH SPECIAL REFERENCE TO THEIR EDUCATIONAL AND OCCUPATIONAL PURSUITS [1]

FRANCISCO M. SACAY AND ALMA C. MENDOZA
Of the Department of Agricultural Education

The elementary school is an important social agency, which affects the life of every individual. In framing a functional curriculum for the elementary school, a knowledge of the activities of its graduates, particularly their educational careers and occupational pursuits, is necessary.

Very little investigation has been conducted on the educational and occupational pursuits of elementary school graduates. Sacay,[2] in his study of 1,040 seventh-grade pupils in Batangas, Cavite, Laguna, Rizal, and Tayabas, reported that 68.6 per cent were intending to pursue further education. The majority of the boys wanted to become farmers, merchants, carpenters, mechanics, and teachers. The girls selected teaching, dressmaking, nursing, and store-keeping as their occupations.

The principal object of this investigation was to determine: (a) the characteristics of seventh-grade graduates in Ilocos Sur, (b) persistence in school and educational attainment, and (c) occupational pursuits.

MATERIALS AND METHODS

This study included 426 pupils who graduated from the seventh grade in the municipalities of Santa, Sinait, Santa Catalina, and Caoayan, province of Ilocos Sur, in 1934, 1935, 1936, and 1937. The school records of these graduates were examined and important data were gathered. Additional data were secured by personal interview. A questionnaire was used in recording the data. In certain cases, when individuals could not be personally contacted, data were secured by correspondence.

The investigation was conducted from January, 1946, to February, 1947, or nine to twelve years after the students had graduated from the elementary school.

RESULTS AND DISCUSSION

Sex of graduates

Of the 426 seventh-grade graduates, 273, or 64.1 per cent, were male and 35.9 per cent, female.

[1] Experiment Station Contribution No. 1600.

[2] SACAY, F. M. 1939. Vocational education studies: II. Occupational background and vocational interests of Grade VII pupils. The Philippine Agriculturist 27: 624–634.

Age of graduates

The average age of the boys and girls at the time of graduation was 14.5 years. The boys were older than the girls by 0.3 year.

Districts from which students were drawn

Almost one half, or 49.0 per cent, of the graduates were from the poblacion; 23.0 per cent, from farming barrios; 18.1 per cent, from fishing barrios; 5.4 per cent, from industrial barrios; and 0.4 per cent, from fishing-farming barrios.

Occupational groups from which graduates were drawn

The graduates were drawn from forty occupational groups. About one third, or 32.2 per cent, were children of farmers. The occupational distribution of the fathers of other graduates was as follows: fishermen, 11.2 per cent; laborers, 8.5; teachers, 7.8; merchants, 16.7; clerks, 3.5; blacksmiths, 2.1; carpenters, 2.1; policemen, 1.1; musicians, 1.7; and shoemakers, 1.4.

Ratings of graduates in Grade VII

About 70.2 per cent obtained ratings ranging from 75 to 79, and 23.7 per cent, from 80 to 84. Only 6.1 per cent received the final rating of 85 or above. The average rating of all graduates was 78.8 per cent. There was no difference in the average rating of male and female graduates.

Educational attainment

More than two thirds of the 426 seventh-grade graduates pursued further education. However, only one half of all seventh-grade graduates completed the high-school course (table 1). About one fourth, or 26.3 per cent, entered college, but only 6.6 per cent finished a four-year course.

The percentage of students who entered the high school was the same for the boys and for the girls (73.2 per cent.) However, more girls (52.3 per cent) than boys (48.7 per cent) graduated from the high school (table 1).

A higher proportion of female than male students pursued studies above the high-school level. Sixteen girls graduated from college, or four more than the boys. At the time of investigation, however, nine boys and five girls were still pursuing college education.

Seventh-grade rating and educational attainment

Of the male graduates who received ratings ranging from 75 to 79, comprising 67.7 per cent of all males, only 2.6 per cent finished college. On the other hand, 9.8 of those with rating from 80 to 84 finished college. Of the female students with ratings ranging from

75 to 79, only 5.4 per cent graduated from college. About 15.0 per cent of those with ratings from 80 to 84 completed a college course.

Of all seventh-grade graduates whose ratings ranged from 75 to 79 per cent, about 55 per cent did not go beyond the high school, and only 22 per cent reached college. In the case of those whose ratings ranged from 80 to 84, about 40 per cent did not graduate from high school, and 35 per cent entered college.

Vocational courses taken in schools of secondary level

Of the 426 seventh-grade graduates, 49.0 per cent took vocational courses in the high school and in special schools of secondary level. Of the 270 students who enrolled in vocational courses, 41.5 per cent took horticulture; 27.4 per cent, poultry and swine; 15.2 per cent, stenotyping; 9.6 per cent, woodworking; and 2.2 per cent, automobile mechanics. The others took typewriting, retail merchandizing, building construction, and canning.

Courses taken in college

Of the 53 students who enrolled in schools of junior-college level, 88.9 per cent took the normal course; 9.3 per cent, secretarial work; and only 1.8 per cent took arts and trade. Fifty-nine students took four-year courses in college. The popular courses pursued by the males were: liberal arts, 23.3 per cent; engineering, 21.1; law, 21.1; education, 13.2; and medicine, 10.5. A few pursued courses in commerce, dentistry, and pharmacy. Among the female students, the popular courses were: education, 38.0 per cent; liberal arts, 19.1; pharmacy, 19.1; nursing, 9.5; dentistry, 9.5; and medicine, 4.8.

Occupational pursuits

The former seventh-grade graduates were engaged in forty occupational pursuits (table 2). They were principally employed as follows: clerks, 13.0 per cent; farmers, 16.7; teachers, 11.8; housekeepers (girls), 9.3; merchants, 7.8; laborers, 6.2; soldiers (boys), 4.7; fishermen (boys), 4.0; and dressmakers (girls), 2.8.

The majority of the male graduates became farmers, clerks, laborers, merchants, and fishermen. Most of the female students became housekeepers, teachers, dressmakers, and merchants.

Sex and occupation

A difference in the nature of occupation pursued by male and female individuals is to be expected. In the case of the males, the distribution of the more important occupations was as follows: farmer, 23.5 per cent; clerk, 17.9; merchant, 7.3; laborer, 8.3; military service, 6.4; fisherman, 5.6; teacher, 5.2; calesa driver, 2.6; policeman, 2.2; shoemaker, 2.2; carpenter, 2.2; merchant, 1.7; and chauffeur, 1.7. Among the females, the distribution was: housekeeper, 32.9 per cent; teacher, 28.6; dressmaker, 9.9; merchant, 8.8;

beautician, 5.5; storekeeper, 2.2; nurse, 2.2; hospital attendant, 2.2; and cloth weaver, 2.2.

Educational attainment and occupation

The educational attainment had some influence on the occupational pursuits of male and female individuals. In the case of male seventh-grade graduates who did not pursue further studies, 41.6 per cent were farmers; 12.5 per cent, fishermen; 9.7 per cent, clerks; 4.2 per cent, merchants; 4.2 per cent, shoemakers; and 4.2 per cent, calesa drivers. While a large proportion of this group took up farming, a smaller percentage did so among those with higher educational attainment. The percentage was 21.3 in the case of those who entered high school but did not graduate, and 16.9 among those who graduated from high school but did not continue further studies. None of those who entered or graduated from college engaged in farming.

The occupational distribution of the male students who entered the high school but did not graduate was as follows: farmer, 21.3 per cent; merchant, 13.2; clerk, 9.9; fisherman, 6.7; laborer, 4.9; chauffeur, 4.9; policeman, 3.3; carretela driver, 3.3; sailor, 3.3; and conductor, 3.3. In the case of high-school graduates who did not pursue further studies, the distribution in the more important occupations was as follows: clerk, 37.0 per cent; military service, 15.4; farmer, 16.9; laborer, 10.8; and merchant, 4.6. Those who entered college but did not graduate became clerks, 17.4 per cent; merchants, 13.1 per cent; and teachers, 13.1 per cent. Of the small number who graduated from college, 81.4 per cent entered the teaching profession.

In the case of the female individuals, 34.7 per cent of the seventh-grade graduates who did not pursue further studies became housekeepers; 21.8 per cent, dressmakers; and 17.3 per cent, merchants. Of those who entered high school but did not graduate, 25.0 per cent became house-keepers; 10.0 per cent, beauticians; and 10.0 per cent, merchants. About 28.7 per cent of those who graduated from high school but did not continue further studies became dressmakers; 21.4 per cent, teachers; 14.3 per cent, merchants; and 14.3 per cent, housekeepers. Of those who entered college but did not graduate, 69.2 per cent became teachers and 26.9 per cent, housekeepers. About 62.5 per cent of those who graduated from college engaged in teaching. It is interesting to note that the teaching profession attracted a large proportion of those with higher education.

Annual income from occupations

The average annual income of the 293 former students amounted to ₱798.94. The average annual income of the male students was slightly higher than that of the female. The former earned an average of ₱790.51 a year and the latter, ₱666.88.

Educational attainment and income

The income of the males was influenced to a certain extent by their educational attainment. This was not the case with the females, except those who graduated from college, who had a much higher income than those with lesser educational achievement.

In the case of the males, the group that entered college had an annual income of ₱882.60, which was higher than the ₱792.30 of those who graduated from the high school but did not continue further studies. The latter group had a slightly higher income than those who did not graduate from high school. In the case of the females, those who graduated from college earned an average of ₱1,200 a year, or nearly twice the income of those who graduated from the high school only. The latter's income was almost the same as that of those who did not graduate from the high school.

Place of business, marital state, home ownership, and home conveniences

The majority of the former seventh-grade graduates pursued their business, or occupation, in their hometown. Only a small proportion migrated to places outside the province. The distribution was as follows: in hometowns, 64.7 per cent; in other towns in the province, 16.4; in towns in other provinces, 7.8; in cities (Manila or Baguio), 10.2; outside the Philippines, 0.9.

About 62.3 per cent of the males and 56.0 per cent of the females were still single at the time of the survey, or eight to twelve years after finishing the seventh grade. Those who got married did so at the average age of 21.9 years.

Only about one third, or 36.2 per cent, of the former seventh-grade graduates were living in their own dwellings. About 60.1 per cent lived in dwellings owned by their parents; the rest rented their homes.

Homes with running water numbered 183, or 42.9 per cent. Only 9.4 per cent had electric lights. Slightly over one half, or 54.0 per cent, had sewing machines, and 25.3 per cent owned phonographs. The other conveniences found in the homes were: radio, 5.4 per cent; piano, 4.2; electric iron, 1.4; icebox, 1.2; and refrigerator, 1.2.

SUMMARY

1. Of the 426 seventh-grade graduates in Santa, Sinait, Santa Catalina, and Caoayan in Ilocos Sur in 1934, 1935, 1936, and 1937, 49.0 per cent came from the poblacion and 23.0 per cent, from farming barrios. The rest were drawn from fishing and industrial communities.

2. The average age of the males at graduation was 14.5 years, or 0.3 year higher than that of the females.

3. About one third were children of farmers and one sixth, children of merchants. The fathers of other graduates were fisher-

men, laborers, teachers, and clerks. The others were distributed in thirty-four other types of occupation.

4. Almost three fourths of the seventh-grade graduates reached the high school, but only one half graduated. About one fourth entered college, but a small number completed the four-year course.

5. A larger percentage of those with higher seventh-grade rating attained higher educational status.

6. The important vocational courses taken by the students in schools of secondary level were horticulture, poultry and swine, stenotyping, and woodworking. Forty-nine per cent took vocational courses.

7. The important courses taken in schools of junior-college level were: normal, 88.9 per cent; secretarial course, 9.3; and arts and trade, 9.8. The courses in college that attracted a large number of students were education, liberal arts, engineering, law, pharmacy, and medicine.

8. A large proportion, or 41.6 per cent, of the male students who did not enter the high school became farmers. Of those who secured high-school education, 21.3 per cent became farmers and 13.2 per cent, merchants. Most of the students who graduated from the high school but did not continue further studies were in clerical positions. About four fifths of those who graduated from college became teachers.

9. A large number of the females who did not acquire high school education became housekeepers, dressmakers, and merchants. Of those who graduated from the high school but did not pursue further studies, 28.7 per cent became dress-makers and 21.4 per cent, teachers. About two thirds of those who entered college became teachers.

10. About 64.7 per cent pursued occupations in their home towns and 16.4 per cent, in other towns of the province.

11. The average annual income of the males was ₱790.61, which was higher than that of the females, which was ₱666.88. The average income of the males was slightly affected by their educational attainment. This was not the case with the females, except the group which graduated from college. The latter's income was much higher than the others.

12. Only 37.1 per cent were married at the time of the survey. The average age at marriage was 21.9 years.

13. Only about one third of the former seventh-grade graduates owned their homes; more than one half lived in homes belonging to their parents. About 42.9 per cent of the homes had running water and 9.4 per cent were provided with electric lights.

TABLE 1

Educational attainment

HIGHEST GRADE OR YEAR REACHED	MALE		FEMALE		TOTAL	
	number	*per cent*	*number*	*per cent*	*number*	*per cent*
Seventh grade, graduated	273	100.0	153	100.0	426	100.0
High school:						
First year	200	73.2	112	73.2	312	73.2
Second year	188	68.9	104	68.0	292	68.5
Third year	159	58.2	88	57.5	247	58.0
Fourth year	133	48.7	80	52.3	213	50.0
Graduated	133	48.7	80	52.3	213	50.0
College:						
First year	54	19.8	58	37.9	112	26.3
Second year	31	11.4	39	25.5	70	16.4
Third year	14	5.1	29	19.0	43	10.1
Fourth year	14	5.1	25	16.3	39	9.2
Graduated	12	4.4	16	10.4	28	6.6

TABLE 2

Occupational pursuits

INDIVIDUAL REPORTING ON HIS OCCUPATION	MALE		FEMALE		TOTAL	
	number	*per cent*	*number*	*per cent*	*number*	*per cent*
Farmer	54	23.5	0	0	54	16.7
Clerk	41	17.9	1	1.1	42	13.0
Teacher	12	5.2	26	28.6	38	11.8
Housekeeper	0	0	30	32.9	30	9.3
Merchant	17	7.3	8	8.8	25	7.8
Laborer	19	8.3	1	1.1	20	6.2
Military service	15	6.4	0	0	15	4.7
Fisherman	13	5.6	0	0	13	4.0
Dressmaker	0	0	9	9.9	9	2.8
Storekeeper	4	1.7	2	2.2	6	1.9
Cochero	6	2.6	0	0	6	1.9
Policeman	5	2.2	0	0	5	1.6
Shoemaker	5	2.2	0	0	5	1.6
Carpenter	5	2.2	0	0	5	1.6
Beautician	0	0	5	5.5	5	1.6
Mechanic	4	1.7	0	0	4	1.2
Driver	4	1.7	0	0	4	1.2
Sailor	3	1.3	0	0	3	.9
Salesboy or salesgirl	2	.8	1	1.1	3	.9
Conductor	3	1.3	0	0	3	.9
Blacksmith	3	1.3	0	0	3	.9
Waiter	1	.4	1	1.1	2	.6
Janitor	2	.8	0	0	2	.6
Baker	2	.8	0	0	2	.6
Textile weaver	0	0	2	2.2	2	.6
Hospital attendant	0	0	2	2.2	2	.6
Nurse	0	0	2	2.2	2	.6
Foreman	1	.4	0	0	1	.3
Secretary to mayor	1	.4	0	0	1	.3
Checker, PX	1	.4	0	0	1	.3
Butcher	1	.4	0	0	1	.3
Basket weaver	1	.4	0	0	1	.3
Watch repairer	1	.4	0	0	1	.3
Truck dispatcher	1	.4	0	0	1	.3
Radio operator	1	.4	0	0	1	.3
Orchestra member	1	.4	0	0	1	.3
Tailor	1	.4	0	0	1	.3
Craftsman	1	.4	0	0	1	.3
Miner	1	.4	0	0	1	.3
Refreshments-parlor owner	0	0	1	1.1	1	.3
Total cases reporting	232	100.0	91	100.0	323	100.0

RESIDUAL EFFECT OF AMMONIUM SULFATE FERTILIZER WITH RICE AS INDICATOR [1]

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WITH THREE TEXT FIGURES

Agriculturists recognize the fact that Philippine soils which have long been under cultivation respond well to the addition of nitrogenous fertilizers. On account of our climatic conditions and of the nature of our rice culture, ammonium sulfate fertilizer has always been preferred to sodium nitrate. A study on the residual effect of ammonium sulfate was undertaken in the Department of Soils of this College from November, 1949, to March, 1951. Although the work was confined entirely to half-55 gallon drum lysimeters filled with Los Baños clay loam, the data may be of value to Filipino farmers who may use ammonium sulfate fertilizer under similar conditions.

MATERIALS AND METHODS

The Los Baños clay loam used in the present work was obtained from the U. P. Rural High School farmstead on the left side of the road to the coffee plantation. It was slightly rolling and grown to cogon, *Imperata cylindrica* (L.) Beauv. and calopogonium, *Calopogonium mucunoides* Desv. The soil was light brown and moderately compact. It pulverized easily when dry but was sticky and plastic when wet. It contained 32.64 per cent clay, 23.37 per cent silt, and 44.09 per cent sand. It had a water-holding capacity of 85.36 per cent, a loss on ignition of 8.83 per cent, and a pH-value of 4.93 in KCl solution and 6.65 in water. Its plant foods held in reserve were 0.90 per cent CaO, 0.49 per cent MgO, 0.17 per cent K_2O, 0.08 per cent P_2O_5, and 0.18 per cent N.

The rice seed used in this study was obtained from Calauan, Laguna. It is a nonbearded and nonlodging Thailand variety, which matures in 119 days. In the lowland farms around the College, where it gives good yields, it is extensively used as a catch-crop. Although it has a relatively low milling percentage, it has a good eating quality.

The ammonium sulfate fertilizer used in this study was obtained from the Department of Agricultural Botany. This fertilizer is gray and dissolves readily and completely in water.

[1] Experiment Station Contribution No. 1601; taken from the thesis presented by the junior author for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, April, 1951.

Sufficient amount of soil was dried in the air, pulverized, screened through a 10-mm. sieve, and then mixed thoroughly. Four petroleum cans of soil were placed in each of twelve set-ups of half-55 gallon drums. [0.56(w) × 1.57(l) × 0.27(d) m.] They were grouped into three lots of four replications each and made to simulate a lysimeter, fig. 1.

Fig. 1.—Lysimeters used in the experiment. (*Photograph by Photographic Division*).

On January 20, 1950, heathy rice seeds soaked in water for 24 hours were planted directly in the drums at the rate of five grains to a hill. Fourteen days later, the seedlings were reduced to two per hill, and 11.5 grams of ammonium sulfate fertilizer were applied to each drum of lots II and III. Lot I served as control. Because of the scanty rainfall during the first culture, each drum was given equal amounts of water until the supernatant liquid was above the soil. Leachings were made 44 days, 74 days, and 86 days after the application of the fertilizer. The leachates of lot II were returned to their corresponding drums, whereas those of lot I and III

were not returned but were analyzed. Because the grains did not ripen uniformly, two harvests were made, one on May 10 and another on May 22, 1950.

To determine the residual effect of the ammonium sulfate fertilizer, a second planting was made on June 30, 1950. Except with the addition of water, the cultures were similarly treated as in the first planting. The crop of this planting was harvested on October 27, 1950.

The pH-values of the soil suspension in water were determined potentiometrically with the use of a Beckman glass electrode pH-meter, model M.

Nitrogen and ash contents of the plants were determined according to the method described by the Association of Official Agricultural Chemists (1945).

Ammonia and nitrate nitrogen contents of the leachates were determined according to the methods of Fred and Waksman (1928).

Calcium was determined in accordance with the method of Merkle (1940).

RESULTS AND DISCUSSION

In the first planting the effect of ammonium sulfate fertilizer applied 14 days after planting became apparent seven days after the application. Figure 2 shows that the 96-day-old plants in lots

Fig. 2.—Comparative stand of 96 days old rice plants in the first planting. (*Photograph by Photographic Division*).

II and III, which were treated with ammonium sulfate at the rate of 11.5 grams to a drum, were taller and darker and had broader leaves and more bearing culms than those of the control. The grain of the treated lots ripened later than that of the control. Espino and Crocker (1940) reported a similar result.

In the second planting the plants in lot II were slightly darker than those in lot III, which approached the color of those in the control lot. This might be due to the greater amount of nitrogen in lot II than in lot III or lot I. The plants of lot II not only had

more tillers and bearing culms but also were taller than those of lot I, which showed better stand than those in lot III (fig. 3).

The plants in the first planting had more luxuriant vegetative growth than those in the second planting. Soriano (1934), Almeda (1937), Talamisan (1938), and Mamañgon 1938) found that liberal application of ammonium sulfate to Lipa City Loam enhanced the vegetative growth of rice.

Fig. 3.—Comparative stand of rice plants in the second planting (residual effect of fertilizer). (*Photograph by Photographic Division*).

In the second planting, algae of the family Cyanophyceae, as identified by Dr. F. T. Orillo of the Department of Plant Pathology, was noticed in the control lot during the waterlogging period of the soil.

In the first culture the standing water in the control lot remained turbid, whereas that in the treated lots became clear, indicating that ammonium sulfate fertilizer accelerated the settling down of soil colloids. The standing water of the control in the second culture remained apparently as turbid as that in the first culture; however, that in the treated lots, which used to be very clear, turned turbid. This phenomenon suggests the probable inverse relation between the degree of turbidity and the amount of ammonium sulfate in the soil.

In the first planting the difference of 129.48 grams between the means of the weight of the grain of lots I and III was highly significant in favor of the latter (table I). Their yields of straw showed a similar trend of result. The increase in yields of grain and straw were 480 per cent and 143 per cent, respectively. These results tend to show that the producing capacity of the soil was very much enhanced by the application of ammonium sulfate fertilizer alone.

Although the addition of ammonium sulfate fertilizer significantly increased the yield, it failed to augment, as shown by statistical analysis, the nitrogen and ash content of the grain. On the other hand, the treated lot produced grain of comparatively low CaO content (table 1).

The amount of ammonia nitrogen in the leachates from the treated lot was only equal to that from the control, showing that ammonium sulfate is leaching resistant. The nitrate nitrogen content of the leachates from the treated lot was, like ammonia, identical to that of the untreated lot, indicating that the waterlogged condition of the soil had retarded the nitrification of ammonium sulfate that may still be in the soil. Bhuiyan (1949) found that nitrate was absent when the soil was waterlogged.

The soil reaction varied insignificantly in the first planting. Although the ammonium sulfate fertilizer was acidic, it did not change significantly the pH-value of the soil. This finding might be due to the presence of high amounts of clay and organic matter, (32.64 per cent and 8.83 per cent, respectively) which are known to be good buffering materials.

There was no appreciable difference between the weights of the grain and straw of lot II and of III. Since the leachates of lot II were returned while those of lot III were not, the apparently identical yields of these two lots showed that the amounts of ammonium sulfate and other plant nutrients in the leachates were not sufficiently high to cause an appreciable change in the fertility of the soil.

The loss of leachates in the treated lot caused a significant decrease in the ash content but not in the nitrogen and calcium contents of the grain.

Returning or discarding the leachates did not appreciably affect the soil reaction, proving that the soil reaction was not readily influenced by the soil materials in the leachates.

The difference between the yields of the control lot and of lot III, whose leachates were discarded, was negligible (table 2), indicating that the fertility of lot III was only equal to that of the untreated lot. This points out that the process of leaching offsets the beneficial effect of ammonium sulfate on the soil.

The nitrogen, ash, and lime contents of the grain of the treated lot were obviously identical to those of the untreated lot (table 2). This supports the previous contention that the treated lot, where the leachates were discarded, had a fertility level equal only to that of the control lot.

However, if leaching was minimized, as in the case of lot II where the leachates were returned, highly significant differences between the yields of lots II and III were obtained. The differences in yields, which may be attributed to the leachates, were 24.85 grams of grain and 33.87 grams of straw, or 31 per cent and 33 per cent, respectively, in favor of lot II.

The nitrogen content of the grain was comparatively higher in the lot where the leachates were discarded. On the other hand, the ash and CaO contents of the grain were identical in lots II and III.

The pH-values of lots I and III in the second culture did not undergo any significant change. This finding was similar to that in the first culture in which the pH-values of the soil remained constant during the entire period of growth of the rice plants. It corroborates the assertion that the soil materials were highly buffered.

The apparently constant pH-values also tend to show that the development of soil acidity due to leaching is not attained in months but in years.

There was no appreciable difference in the pH-values of the second culture and first culture. This revealed that the physical and chemical compositions of the buffering materials in soils were not readily altered by physical, chemical, and biological processes.

SUMMARY

1. Under the conditions of the experiment, assimilation of the nitrogen was apparent seven days after the application of ammonium sulfate fertilizer. The rice plants, Thailand variety, in the treated lots not only were darker and taller but also had broader leaves and more bearing culms than those in the control lot.

2. The supernatant liquid of the untreated lot remained turbid, whereas those of the treated lots turned clear, indicating that such a phenomenon may serve as a practical method of testing whether or not the soil has been recently fertilized.

3. The application of ammonium sulfate fertilizer alone at the rate of 11.5 grams to a drum of soil, 0.89 square meter, increased significantly the yields of grain and straw. The effect of leaching was insignficant in the first culture.

4. The addition of ammonium sulfate fertilizer failed to influence the nitrogen and ash contents of the grain, whereas its CaO content was decreased. With minimized leaching, the ash content of the grain was increased, whereas nitrogen and CaO remained the same.

5. Leaching was a critical factor in the duration of the beneficial effect of ammonium sulfate fertilizer even if it is leaching resistant. With minimized leaching, the amount of fertilizer which may be applied in the next planting may not be so much as that used in the first planting. When leachings were allowed, the fertility of the treated lot was equal only to that of the untreated lot and, therefore, the addition of the usual amount of the fertilizer should be done every planting.

6. The addition of physiologically acidic ammonium sulfate fertilizer had no significant effect on the pH-values of the soil presusumably because the soil materials were not only highly buffered but also resistant to the reaction of the fertilizer and to the physical, chemical, and biological forces in soils. It may be inferred, therefore, that the development of soil acidity is not an instantaneous reaction but a slow process.

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SUMMARY TABLE 1

Effect of ammonium sulfate fertilizer

DETERMINATION	LOTS			COMPARISON OF LOTS	
	I	II	III	I & III	II & III
Yield of grain, grams	27.05	139.18	156.53	HS	I
Yield of straw, grams	112.65	251.45	294.60	HS	I
Nitrogen in grain, per cent	1.11	1.28	1.34	I	
Ash in grain, per cent	11.82	16.77	13.98	I	I
CaO in grain, per cent	0.027	0.003	0.003	HS	HS
Total ammonia nitrogen in leachates, milligrams	22.7	—	31.3	I	I
Total nitrate nitrogen in leachates, milligrams	20.0	—	31.3	I	
pH-values	7.01	6.77	6.83	I	I

I—Insignificant
S—Significant
HS—Highly significant

SUMMARY TABLE 2

Effect of ammonium sulfate fertilizer

DETERMINATION	LOTS			COMPARISON OF LOTS	
	I	II	III	I & III	II & III
Yield of grain, grams	81.83	106.10	81.25	I	HS
Yield of straw, grams	99.73	136.85	102.98	I	HS
Nitrogen in grain, per cent	1.21	1.02	1.30	I	HS
Ash in grain, per cent	13.22	11.59	9.98	I	I
CaO in grain, per cent	0.018	0.015	0.019	I	I
pH-values	6.75	6.47	6.52	I	I

I—Insignificant
S—Significant
HS—Highly significant

THE INFLUENCE OF DRIED RUMEN CONTENTS OF CATTLE ON THE RATE OF GROWTH OF CHICKS [1]

ANTONIO U. SERRAON

In Italy in 1939, according to Heuser,[2] Usuelli and Fiorni conducted experiments which indicated an increase in the growth of chicks with the addition of the rumen contents of slaughtered cattle to a diet possibly deficient in proteins. To determine the usefulness of the rumen contents as a supplement in the College growing ration, the present study was conducted in the Department of Animal Husbandry from February, 1949, to November, 1949.

MATERIALS AND METHODS

Two hundred and eighty-four New Hampshire chicks artificially hatched from eggs laid by the College flock were used in the study. Three trials, each covering a period of twelve weeks, were conducted. Each trial consisted of two lots, which were brooded separately in identical pens with concrete floors and rice hulls as litter. Each pen had an adjoining well-ventilated, fireless, brooding compartment.

Lot I, the control, was given the College chick ration consisting of the following ingredients, all parts by weight:

Rice bran (fine)	55
Ground corn	20
Fish meal	20
Copra meal	5
Total	100

A mixture composed of 90 parts of the College ration and 10 parts of finely ground dried rumen contents was given to Lot II. Both rations were given in the form of dry mash. Except for the difference in the feed, both lots were given the same care and management.

Records were kept of the initial and weekly weights of the individuals birds taken with the use of an "Ohaus" balance sensitive to one-tenth of a gram, of the feed consumption, and of the mortality in both lots.

The rumen contents of slaughtered cattle used in this study was obtained from the Grove, College.[3] The fresh rumen contents were

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[1] Experiment Station Contribution No. 1602. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, April, 1950. Prepared in the Department of Animal Husbandry under the direction of Professor F. M. Fronda.

[2] HEUSER, GUSTAVE. 1946. Feeding poultry. vii + 543 p. 10 fig. New York: John Wiley & Sons, Inc.

[3] The writer wishes to express his gratitude to Mr. Nicolas Kalaw for supplying the fresh rumen contents for this experiment.

dried under the sun on flat, galvanized iron sheets. During fair weather, it took from five to seven days to dry a 20-liter can of fresh rumen contents weighing about 18 kilograms to a dry weight of about 2.2 kilograms. The proximate chemical analysis of the dried material as determined by the Department of Agricultural Chemistry is as follows: moisture, 15.09; ash, 14.34; crude protein, 10.00; total carbohydrates, 25.10; crude fiber, 27. 62; and crude fat, 7.85, all in per cent.

RESULTS AND DISCUSSION

Rate of growth. Table I shows that in the first trial, the difference in the average biweekly weights between the two lots was insignificant, although the experimental lot had consistently higher average weights than the control. However, beginning with the eighth week, the differences between the two lots progressively increased. Had the experiment been carried further, the lot fed with dried rumen contents would perhaps have eventually had significantly higher weights than the control.

In trial 2, the increase in both lots was irregular. From the seventh to the twelfth week, the average weights in the control lot were higher than those in the experimental lot; the differences, however, were insignificant. The increase in weight in the control lot was gradual; however, from the eight to the twelfth week, the gap between the two lots widened.

In trial 3, the rumen-fed lot was consistently heavier than the control lot up to the end of the experiment. As the chicks approached the weaning age, the differences increased weekly so that at the end of the twelfth week the difference of 126.76 grams was significantly in favor of the experimental lot.

It is obvious that trials 1 and 3 gave similar results. The deviations obtained in trial 2 may be attributed to a number of factors, one of which may be the changes in weather conditions that prevailed during the course of the experiment. The high temperature during the months of April and May (at the start of trial 2) might have unfavorably affected the body constitution of the birds. Also, during the drying process the galvanized iron sheets might have been so heated as to cause the destruction of some vitamins and minerals of the rumen contents. Another factor may be the quality of the feed in the rumen. During the dry season the forage in pastures is not desirable for cattle grazing. Trials 1 and 3 were conducted during the mildest part of the year, when the vegetative growth in the pastures is vigorous and the greens are richest in their vitamin contents. The quality of the rumen contents of cattles at this time of the year may be ascribed to the high quality of pasturage. The failure to realize a consistent effect of the nutritive value of the rumen contents on the rate of growth may be due also to the difference in the method of separating and drying the rumen contents and the manner of feeding it to the birds.

Feed consumption and feed cost. As shown in table 2, in all the trials the chicks in both lots consumed more or less the same amount of feed. On the basis of the efficiency of converting the feed consumed to make gains in weight, the experimental lots in trials 1 and 3 were slightly more economical than the control. Generally, however, the two rations can be said to compare favorably in efficiency. The addition of dried rumen contents did not affect the palatability of the feed; it was as well relished by the chicks as the control ration.

In all the trials, the cost of the experimental feeds was less than that of the control, the assumption being that the cost of labor in the process of collecting and drying the rumen contents was free. The returns above feed cost of the experimental lots in trials 1 and 3 were higher than the control lot by ₱14.46 and ₱26.32, respectively. The control lot in trial 2, however, gave a return of ₱9.50 more than the experimental lot. Had the cost of labor in preparing the rumen contents been considered, there might not have been any advantage gained by the experimental lots in trials 1 and 3 over the control.

Mortality. The highest mortality rate as shown in table 3 was found in trial 1, and the least in trial 3. The high mortality rates in both lots were due to outbreaks of coccidiosis and roup as early as in the third week and the prevalence of fowl pox from the eighth to the twelfth week. The percentages of mortality were as follows: Lot I, the control, 73.68 in trial 1, 41.66 in trial 2, and 48.65 in trial 3; lot II, 78.95 in trial 1, 41.66 in trial 2, and 32.43 in trial 3. On the whole, the lower mortality rates in trials 2 and 3 were due to the preventive measures given the chicks as soon as symptoms of the diseases were noted.

SUMMARY

1. The addition of the dried rumen contents of cattle to a growing ration did not significantly increase the size of the chicks weaned at the age of 12 weeks.

2. The ration containing dried rumen contents of cattle was as well relished by the chicks as the ration without it.

3. The mortality among the rumen-fed chicks was slightly lower than that of the control.

4. The slight advantage derived from the addition of dried rumen contents to the growing ration is not sufficient to justify its use.

THE INFLUENCE OF HYBRIDIZATION ON THE PROTEIN CONTENT OF MAIZE [1]

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The present investigation was undertaken in the Department of Agricultural Botany, College of Agriculture, University of the Philippines at Los Baños, Laguna, from May, 1950, to March, 1951, to determine the effects of crossing on the protein content of some well-established varieties of Philippine corn.

MATERIALS AND METHODS

Three varieties of corn produced and maintained in pure cultures in the Department of Agricultural Botany were used in this experiment. Their description follows:

(a) *Lagkit.* This variety, as described by Capinpin [2] is characterized by its smooth, opaque, and purely white grains. It is glutinous; when boiled, the grains are sticky, hence, the name. The materials used in these experiments were those isolated by Capinpin and Cruz [3] in the inbreeding of Lagkit corn.

(b) *Native Yellow Flint.* The College strain of this variety was used. As the name implies, the grains of this variety are all yellow and flinty.

(c) *Cuban Yellow Flint.* The kernels of the variety, like those of the Native Yellow Flint, are yellow and flinty. The original seed of Cuban Yellow Flint was obtained from the Estacion Experimental de Agronomia at Havana, Cuba. The salvaged kernels of this variety originally maintained in cultures by the Department of Agricultural Botany were secured from the Los Baños Economic Garden.

The three varieties were planted in lots spaced one row apart to minimize pollen contamination. The seeds were planted ear-to-row on three lots, one variety to a lot. The distance of planting was from 60 to 70 centimeters between hills in the row and about 25 to 30 centimeters between furrows.

The Cuban Yellow Flint was planted one week earlier than the other varieties to synchronize the maturity periods of the different varieties in order to carry out cross-pollination effectively.

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[1] Experiment Station Contribution No. 1603. Part of thesis presented by the junior author for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, April, 1951.

[2] CAPINPIN, J. M. 1937. A lethal-linked kernel variation of lagkit corn. Philippine Agriculturist 27: 866–874.

[3] CAPINPIN, J. M., AND R. R. CRUZ. 1950. The effects of inbreeding lagkit corn. Philippine Agriculturist 34: 10–20.

At tasseling and silking time, from the latter part of August to the early part of September, 1950, the varieties were artificially crossed to produce all their possible F_1 combinations. During this period, the pollen of the staminate parent was transferred to the silk of the pistillate parent by shaking the tassel of the staminate parent over the silk of the ear shoot of the pistillate parent. Paper bags were used to protect the ear shoots from contamination by other pollens. After harvest, parallel cultures of parental and hybrid combinations were made. The parental types and F_1 hybrid combinations were planted on November 11, 1950. Harvesting was completed on January 28, 1951.

Analysis of the protein content was made in the Department of Agricultural Botany from February 12 to February 17, 1951, according to the method described by the A.O.A.C.[4] The protein content was expressed as percentage by weight. All figures were based on average of duplicate determinations.

EXPERIMENTS AND RESULTS

Variability in protein content. The three strains or biotypes of maize exhibited marked differences in protein content. The two native strains, the Lagkit and the Native Yellow Flint, had considerably higher percentages of protein than the introduced variety, the Cuban Yellow Flint. The first-generation crosses between any of these three strains also showed an increase in protein content. The apparent increase in protein content shown by the first generation crosses suggests that this particular chemical constituent of maize may behave like any other ordinary Mendelian character and is influenced by heterosis.

The parental types used in this hybridization work were tentatively classified as follows: (1) high protein content—Lagkit; (2) medium protein content—Native Yellow Flint; and (3) low protein content—Cuban Yellow Flint. The protein content of the parental types, expressed in percentages, are as follows: Lagkit, 6.50; Native Yellow Flint, 5.00; and Cuban Yellow Flint, 2.97.

On the basis of this classification, the following crosses were made:

(1) High × Medium (represented by Lagkit × Native Yellow Flint).
(2) High × Law (represented by Lagkit × Cuban Yellow Flint).
(3) Medium × High (Native Yellow Flint × Lagkit, reciprocal of No. 1).
(4) Medium × Low (Native Yellow Flint × Cuban Yellow Flint).

[4] A. O. A. C. 1945. Official and tentative methods of analysis. 6th ed. xii 932 p. Washington, D.C.: A. O. A. C.

(5) Low × High (Cuban Yellow Flint × Lagkit, reciprocal of No. 2).
(6) Low × Medium (Cuban Yellow Flint × Native Yellow Flint, reciprocal of No. 4).

Protein content of parental types and F_1 hybrids. The hybrids had generally a higher protein content than either parent, or even higher than the average of the parents (table 1). Whenever the staminate parent had either a high or a medium protein content, the resulting progeny generally showed an increase in protein content over that of either parent and over the average of the parents. However, when a low-protein parent was used to pollinate a high or a medium-protein pistillate parent, the hybrids had lower protein content than the parental types. The results of the crosses seem to indicate that the hybrids high in protein content came from parents high in this particular character. This observation is similar to that of Gorfinkel [5] on the influence of crossing on the nicotinic acid content of corn. The F_1 hybrid between strains containing high or medium protein content showed a tendency to exceed or approach the composition of the high-protein parent.

The average decrease or increase in protein content of the F_1 hybrids ranged from 52 per cent lower than the protein content of the high-protein parent to 195 per cent in excess of the low-protein parent (table 2). In either case, the increase or decrease in protein content was manifested over or below the pistillate parent. The greatest percentage of increase in protein content of the F_1 hybrids over the average of the parents was found in a cross between high and low (Lagkit × Cuban Yellow Flint), whereas the largest percentage decrease below the average of the parents was found in the reciprocal of this cross, low × high (Cuban Yellow Flint × Lagkit).

SUMMARY

1. The crosses between strains of maize affected the protein content in the first generation just as yield was influenced by hybrid vigor.

2. The protein content of hybrids generally exceeded that of either parent, except in cases where pollen from a low-protein strain or variety was used, even if the pistillate parent had a high protein content.

3. With either the protein content of either parent or the average of both parents as the basis for comparison, the greatest percentage of increase in the protein content of F_1 hybrids was observed in the cross between Lagkit (high-protein) and Cuban Yellow Flint (low-protein). On the other hand, a decrease in protein content was shown in the cross between Cuban Yellow Flint (low-protein) and Native Yellow Flint (medium-protein).

[5] GORFINKEL. 1948. The influence of crossing on the nicotinic acid content of maize. Jour. Agric. Sci. 38: 339–342.

TABLE 1

Average percentage of the difference in protein content between F_1 hybrid and either of the parents, and the average protein content of the two parents

HYBRID COMBINATIONS [a]	PROTEIN CONTENT OF PARENT (N × 6.25)		AVERAGE OF PARENTS	AVERAGE PROTEIN CONTENT OF HYBRID F_1 (N × 6.25)	DIFFERENCE [b]		
					STAMINATE PARENT	PISTILLATE PARENT	AVERAGE OF PARENTS
	per cent	*per cent*		*per cent*	*per cent*	*per cent*	
(L × N) F_1 ..	6.50	5.00	5.75	9.43	+ 2.93	+ 4.43	+ 3.68
(L × C) F_1 ..	6.50	2.97	4.74	8.75	+ 2.25	+ 5.78	+ 4.01
(N × L) F_1 ..	5.00	6.50	5.75	6.10	+ 1.10	— 0.40	+ 0.35
(N × C) F_1 ..	5.00	2.97	3.99	5.08	+ 0.08	+ 2.11	+ 1.09
(C × L) F_1 ..	2.97	6.50	4.74	3.12	+ 0.15	— 3.38	+ 1.62
(C × N) F_1 ..	2.97	5.00	3.99	2.93	+ 0.04	— 2.07	+ 1.06

[a] First letter, pistillate parent; second letter, staminate parent.
[b] + = Difference is in favor of hybrid.
— = Difference is in favor of parent.
L = Lagkit
N = Native Yellow Flint
C = Cuban Yellow Flint

TABLE 2

Average percentage of increase or decrease in protein content of F_1 hybrids over or below the protein content of parent strains

F_1 AND PARENTS	HYBRID OVER (+) OR BELOW (—) LOWER YIELDING PARENT	HYBRID OVER (+) OR BELOW (—) HIGHER YIELDING PARENT	HYBRID OVER (+) OR BELOW (—) AVERAGE OF PARENTS
	per cent	*per cent*	*per cent*
(Lagkit × Native Yellow Flint) F_1			
Lagkit	—	+ 45.1	—
Native Yellow Flint	+ 88.6	—	—
Average of Parents	—	—	+ 64.0
(Lagkit × Cuban Yellow Flint) F_1			
Lagkit	—	+ 34.6	—
Cuban Yellow Flint	+ 194.6	—	—
Average of Parents	—	—	+ 86.7
(Native Yellow Flint × Lagkit) F_1			
Native Yellow Flint	+ 22.0	—	—
Lagkit	—	— 6.1	—
Average of Parents	—	—	+ 6.1
(Native × Cuban Yellow Flint) F_1			
Native Yellow Flint	—	+ 1.6	—
Cuban Yellow Flint	+ 71.0	—	—
Average of Parents	—	—	+ 27.3
(Cuban Yellow Flint × Lagkit) F_1			
Cuban Yellow Flint	+ 5.0	—	—
Lagkit	—	— 52.0	—
Average of Parents	—	—	— 34.1
(Cuban Yellow Flint × Native Yellow Flint) F_1			
Cuban Yellow Flint	— 1.3	—	—
Native Yellow Flint	—	— 41.4	—
Average of Parents	—	—	— 26.5

THE INFLUENCE OF RESTRICTED FEEDING ON PULLETS FROM 12 TO 24 WEEKS OLD [1]

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Of the Department of Animal Husbandry

Platt and Stover [2] found that S. C. White Leghorn pullets fed without mash from the age of 12 weeks to the start of egg production suffered a delay of approximately 8 weeks in sexual maturity. They further reported that the exclusion of all protein concentrates from the diet resulted not only in a delay of sexual maturity but also in a higher mortality rate. On the other hand, Heuser, Norris, and Bruckner [3] stated that although marked feeding restriction adversely affected growth, sexual maturity, and egg production, moderate restriction of feed did not affect the birds, and that pullets given limited ration can be satisfactorily reared on good pasture.

In order to determine the influence of restricted feeding on pullets from 12 to 24 weeks old, this study was conducted in the Department of Animal Husbandry from December, 1947, to January, 1949.

MATERIALS AND METHODS

One hundred 12-week-old New Hampshire weanling pullets previously brooded together and given identical feeding and management in battery cages were used in the study. The birds were distributed at random into two equal lots. Lot I was given free access to mash and grains at all times during the day. In lot II, the mash and grains were fed two hours in the morning, and as much grains as could be normally consumed in ten to fifteen minutes was given in the afternoon. On Wednesdays and Sundays, the birds were given nothing except as much grains as they could clean up in ten to fifteen minutes in the afternoon. During the morning feeding the grains and the mash feeds were given in the same proportion as in lot I, that is, one part of grains to one of mash. Each lot was provided with two adjoining yards with an excellent stand of sweet potato pasture. These yards were rotated to insure a continuous supply of excellent green feed.

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[1] Experiment Station Contribution No. 1604. Based on the thesis presented by the junior author for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, 1949.

[2] Platt, C. S., and H. W. Stover, Jr. 1945. Sexual maturity, adult mortality, and egg production of White Leghorn pullets in relation to their diet during the growing period. New Jersey Agric. Exper. Sta. Bull. 716: 1–19.

[3] Heuser, G. F., L. C. Norris, and J. H. Bruckner. 1945. Pasture experiment with growing pullets. Cornell University Agric. Exper. Sta. Bull. 823: 5–20.

The grains given to the birds consisted of palay alone. The mash was composed of the following ingredients, all parts by weight:

Fine rice bran	5
Copra meal	2
Ground corn	2
Fish meal	1
Ground shells and grit	*ad libitum*

On the twenty-fifth week, however, 38 pullets selected from lot I and 37 from lot II were combined and transferred to a laying house provided with a sun-porch and were given hereafter the College all-mash laying ration consisting of the following ingredients, all parts by weight:

Fine rice bran	4
Copra meal	3
Ground corn	2
Fish meal	1
Ground shells and grit	*ad libitum*

The weekly weights of the birds in both lots until they reached the age of 24 weeks were taken and recorded. The pullets were weighed again on the 28th week of age. Records were also kept of the age at maturity of the pullets, the weight of the first five eggs laid, and of the percentage of egg production of both lots from maturity to January 31, 1949.

DISCUSSION OF RESULTS

Average weekly growth. Although the pullets had been separated at random, lot I, which was given grain and mash *ad libitum*, started with a lower mean weight than lot II. After the first week, however, the birds in lot I overtook those in lot II and had a higher weekly gain than those in the restricted lot during the first three weeks of the experiment. After this period, there was an abrupt decline in weight in lot I. During the fifth week, the birds in both lots had almost the same average weights. From the sixth up to the twelfth week, however, lot I regained its lead, and from then on, the mean weight of lot I was always higher than that of lot II. The crossing of the growth curve about the fifth week of the observation may be attributed to the fact that during the rainy days, the yards and pen of lot I were relatively more damp, being lower in elevation than lot II; hence a number of the birds were attacked by roup. The mean weight of the pullets in lot I at the age of 24 weeks was 1331.5 $\mp$ 38.41 grams, and that of lot II, 1202.1 $\mp$ 38.79 grams, or a difference highly significant in favor of lot I. The average gain in weight of the pullets in lot I from 12 to 24 weeks of age was 65.6 grams, which is significantly higher than that of lot II, 53.2 grams.

After the twenty-fourth week, when the selected birds in lots I and II were given similar full feeding, a rapid gain in weight was made by the lot II birds, so that at the 28th week of age, the weights of the birds from both lots were almost the same, lot I averaging 1718.2 ∓ 24.64 grams and lot II, 1716.2 ∓ 25.35 grams. The gain in weight made by the selected birds of lot I during this period was lower than that made by the birds in lot II; those in lot I gained 357.9 grams, and those in lot II, 424.4 grams. The greater gain made by lot II may be explained by the fact that the birds raised under the restricted feeding plan before the twenty-fourth week of age, when given full feeding, probably developed the necessary appetite to consume enough feed necessary for proper body development.

Feed consumption and cost. The total feed consumption of the birds in lot I during the twelve weeks of study was 342.77 kg., consisting of 197.88 kg. of mash and 144.89 kg. of palay. The restricted birds in lot II had a markedly lower feed consumption than those of lot I, the consumption of lot II being 103.26 kg. of mash and 99.96 kg. of palay or 203.22 kg. of feed. Each pullet in lot I consumed a computed amount of 4.04 kg. of mash and 2.50 kg. of palay, which cost ₱0.88 and ₱1.02, respectively; whereas each pullet in lot II consumed only 2.13 kg. of mash and 2.06 kg. of palay, which cost ₱0.46 and ₱0.72, respectively. The amount saved by restricting the feed was 139.55 kg. consisting of 94.62 kg. of mash and 44.93 kg. of palay. In addition to this saving, the lot II pullets at 24 weeks of age still maintained almost at par with those fed *ad libitum* in most respects, except in average weight. Apparently, the camote pasture used in this study had supplied the nutritive deficiencies of lot II.

Mortality. Restricted feeding had apparently little or no adverse effect on the health of the birds. Two birds died in lot II, one by strangulation and the other of some disease. Two pullets in lot I were killed by wild animals; another died of a disease suspected to be tuberculosis. Thus, during the period when the pullets were restricted in their feed, the mortality was only 4 per cent, whereas at the time when feed was non-restricted, the mortality was 6 per cent.

The difference in mortality when the pullets were already in the laying house was almost negligible. Two out of the 38 birds in lot I and 2 out of the 37 birds in lot II died of paralysis. The mortality for lots I and II was 5.2 per cent and 5.4 per cent, respectively.

Quality of pullets produced. At the age of 24 weeks, that is, at the close of the period of restricted feeding, the pullets were classified on the basis of their live weights. Pullets weighing less than 1000 grams were classified as grade C; from 1000 to 1300 grams, grade B; and over 1300 grams, grade A. Pullets of slightly better quality were produced in the non-restricted lot. In lot I, there were 26 birds classed as grade A, 17 as grade B, and 4 as grade C; whereas in lot II, there were 22 in grade A, 17 in grade B and 9

in grade C. The average weights of the pullets in lot I were as follows: grade A, 1555.3 grams; grade B, 1182.2 grams; and grade C, 872.7 grams; those in lot II were 1486.2, 1165.5, and 820.3 grams for the respective grades.

Average age at maturity and weight of the first five eggs laid. The criterion used for maturity is the age of the bird when it lays its first egg. The fiirst pullet in lot II matured in 190 days and the last, in 274 days. In lot I, the respective ages of the first bird and the last bird at maturity were 197 and 277 days. The first pullet in lot II matured seven days earlier and the last pullet, three days sooner than those in lot I. The average age of maturity of the pullets in lot II was 231.8 $\mp$ 3.91 days, whereas that of lot 1 was 239.0 $\mp$ 3.08 days. The difference between these figures was statistically insignificant.

Weight of pullets at maturity. When the pullets attained sexual maturity, those in lot I averaged 1886.9 $\mp$ 17.34 grams and those in lot II, 1853.7 $\mp$ 23.35 grams. The difference between these weights was insignificant, lot I being heavier than lot II by only 33.2 $\mp$ 4.90 grams. The fact that the birds in lot II made rapid gains after the termination of the restricted feeding period accounts for such an insignificant difference.

Weight of first five eggs laid. The first five eggs laid by the pullets in lot II were only slightly heavier than those in lot I, the average weight being 54.1 $\mp$ 0.71 for lot II and 52.4 $\mp$ 0.55 grams for lot I. The difference between the two lots was statistically insignificant.

Egg production. Egg production in both lots had a tendency to increase from the first month to the sixth month of observation. From the first up to the fourth laying month, lot II gave a distinctly higher percentage of egg production than lot I. However, lot I equalled lot II in the number of eggs produced on the fifth month and markedly surpassed the latter on the sixth month. During the entire period, lot II had an average egg production of 33.2 per cent, only 1.5 per cent higher than that of lot I, which was 31.7 per cent. These apparently good results favoring the restrictly-fed lot may be explained by the fact that pullets raised on a controlled feeding plan might have been kept in proper breeding condition and had no physical injury to hamper their physiological activities during the period.

Fertility and hatchability of the eggs. The hatchability of eggs from lot II was 87.67 per cent, 3.55 per cent higher than that of lot I, which was 84.12 per cent. The fertility of eggs from lot II was 93.62 per cent, or 1.83 per cent higher than that of lot I, which was 91.97 per cent. The differences obtained were, however, insignificant.

SUMMARY

1. Pullets raised by restricted feeding grew significantly slower than those fed liberally up to the end of the 24th week. At maturity, however, there was no significant difference between the selected birds from both lots which were given identical feeding and management from the 24th to the 28th week.

2. Each bird in lot I consumed, on the average, 4.04 kg. of mash and 2.95 kg. of palay; that of lot II, only 2.13 kg. of mash and 2.06 kg. of palay.

3. There was no appreciable difference in the percentage of mortality between the two lots.

4. There was no significant difference in the egg production of the selected pullets of the two lots.

5. Slightly better quality of 24-week-old pullets were produced in the lot fed *ad libitum* than in the lot raised by restricted feeding.

6. On the average, the pullets selected from the lot fed *ad libitum* matured at the age of 239.0 days; those selected from the restricted lot, at 231.8 days.

7. There was no significant difference in the mean weights of the first five eggs laid by each bird from either lot. Likewise, the fertility and hatchability of the eggs produced by both lots showed no appreciable difference.

8. The results of this experiment tend to show that a judicious restriction of feed may be practiced on growing pullets from 12 to 24 weeks of age, provided that a good pasture is made available to them.

THE GROWTH, DEVELOPMENT, AND FEED CONSUMPTION OF ARTIFICIALLY RAISED NATIVE KIDS [1]

ONOFRE C. MENDOZA

A study was conducted in the Department of Animal Husbandry from May 24, 1947, to January 31, 1948, to find if kids could be successfully raised artificially and to determine the growth and development of these kids up to the time they were subsisting well on concentrate and roughage.

MATERIALS AND METHODS

Animals. Twenty-one kids, 12 males and 9 females, separated from their dams three days after birth, were used in this investigation. The birth weight of the kids ranged from 1.2 to 1.8 kilograms or an average of 1.5 kilograms.

Feeds. The kids were fed cow's and goat's milk. Concentrates made up of equal parts by weight of ground corn, fine rice bran, and copra meal were provided. For soilage, the animals were given a variety of forage plants, principally *Centrosema pubescens* Linn., Para grass (*Panicum purpurascens* Raddi), Guinea grass (*Panicum maximum* Jacq.), Napier grass (*Pennisetum purpureum* Schum.), culape (*Paspalum conjugatum* Linn.), and sweet potato vines.

Granulated table salt in a salt box was supplied to the animals.

Pens. The animals were confined in an inclosure 6 meters wide and 3½ meters long with concrete flooring. Poultry wire netting and a cement wall on one side served as fence. Five smaller pens (1 m. × 1 m. × 1 m.) were constructed to separate individual animals in determining concentrate and roughage consumption. A sunning inclosure adjoining the pen was made.

Feed racks. A feed rack (3 m. long and 0.3 m. wide) and smaller feeding receptacles for determining concentrate and roughage consumption were provided.

Measuring devices. A graduated bottle with a rubber nipple was used to measure as well as to feed the milk to the young kids. Older kids got their milk from a pan. The kids were weighed on a Fairbanks balance and the concentrates and roughage, on a Cenco platform scale. The height at withers, length of body, width of shoulder and hip were determined by means of a wooden caliper. A tape measure was used for determining the heart girth.

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[1] Experiment Station Contribution No. 1605. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, March, 1948. Prepared in the Department of Animal Husbandry under the direction of Professor Valente Villegas.

Feeding. From birth up to the third day, the kids were allowed to stay with their dams to allow them to get much of the colostrum, or first milk, of the mother. On the fourth day, the kids were separated from their dams and raised artificially. They were trained to suck milk from the bottle feeder according to the method used by Fernandez.[2]

During the first two weeks the kids were given milk three times a day—in the morning before nine o'clock, at noon before one o'clock, and between five and six o'clock in the afternoon. From the third to the ninth week they received milk twice a day—in the morning before nine o'clock, and in the afternoon between five and six o'clock. From the tenth week the kids were given milk only once a day in the morning. The kids learned to take milk from the pan when they were seven to eight weeks old; from this time they were no longer fed with the bottle feeder.

The concentrate and soilage were fed to the animals in the morning and in the afternoon. Any left-over concentrate was removed and replaced with fresh material. The concentrate and roughage consumption for each animal was determined once a week. Fresh water was made available to the animals in the daytime.

Housing at night. The newly separated kids were placed in a box with straw bedding to protect them from cold. The bigger ones congregated in a corner bedded with dry straw. Some preferred to stay on a bench.

Sunning. The kids went out to the sun in the morning. In the afternoon, they also received sunlight on the west side of the pen.

Sanitation. Every morning and afternoon the inclosure or pen was cleaned of feces and urine scattered on the floor. The flooring was splashed with water usually twice a week.

Weighing and measuring. The kids were weighed and measured at birth and weekly thereafter until the end of the work. This was done early in the morning. The animals were allowed to stand squarely on their legs before any measurement was taken. The following measurements were made:

Height at withers. The height was determined by measuring the perpendicular distance from the ground to the top of withers.

Heart girth. This was obtained with the use of a tape by measuring the animal around the chest.

Length of body. This was determined by measuring the distance from the point of the shoulder to the pin bone.

Width of shoulder. This was taken by measuring across the widest portion of the breast.

Width of hip. This was taken between the points of the hip.

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[2] FERNANDEZ, W. L. 1950. Raising of lambs artifically. Philippine Jour. An. Ind. 11: 57–62.

RESULTS AND DISCUSSION

Liveweight. The greatest increase in weight was made in the first two weeks, 0.37 kilograms or 6.32 per cent, and 0.43 kilograms, or 7.35 per cent, for the first and second week, respectively. From the third to the ninth week, the kids gained steadily an average weekly increase in weight of no less than 0.20 kilograms. From the tenth week, the weekly gain was less than those of the previous weeks; on the eleventh week, an average decrease of 0.05 kilograms was noted. The kids during this period were infested with parasites (*Haemonchus contortus* Rudolphi), a condition which accounted for the variable and little increase in weight. On the eighteenth week, the animals began to recover from the infestation as shown by the average weekly increase in weights. From birth to the twenty-eighth week, each kid made an average gain in weight of 5.85 kilograms.

Height. The greatest increase in height was obtained in the first week, 1.15 centimeters, or 10.69 per cent, of the total increase. From the second to the eighth week, the average weekly increase was more or less constant. On the ninth week, the average weekly increase declined. The weekly increase was more or less constant until the seventeenth week, the increase being no more than 0.30 centimeters, or 3.0 per cent, of the total increase. On the eighteenth week, the average weekly increase was more than that of the previous weeks, and this more or less was maintained until the twenty-eighth week. From birth to the end of the study the animals made an average gain in height of 10.76 centimeters.

Heart girth. The increase in heart girth was greatest in the first four weeks, with an average weekly increase of no less than 1 centimeter, or 6.76 per cent, of the total increase. From the fifth week, the weekly average increase did not exceed 1 centimeter, From birth to the twenty-eighth week, the animals made an average increase in heart girth of 17.60 centimeters.

Length of body. The most rapid gain in length was obtained in the first week, 1.19 centimeters, or 10.61 per cent, of the total increase. From the second to the ninth week, the average weekly increase declined; the average increase during the ninth week was only 0.24 centimeters, or 2.14 per cent, of the total increase. From then on, the average weekly increase was more or less constant. From birth to the twenty-eighth week, the animals made an average increase of 11.22 centimeters in length of body.

Width of shoulder. A marked increase in width of the shoulder of the animals was noted on the first seven weeks, with the greatest during the first week, when the average increase was 0.29 centimeters, or 7.35 per cent, of the total increase. From the eighth week, the average weekly increase was less than those of the previous weeks, but never exceeding 0.02 centimeters. The weekly increase was more or less constant until the end of the study. From

birth to the twenty-eighth week, the animals made an average increase of 3.95 centimeters in the midth of shoulder.

Width of hip. The greatest gain in width of the hips was noted during the first week, 0.31 centimeters, or 11.97 per cent, of the total increase. From the eighth week, the increase was more or less steady, sometimes barely exceeding an average of 0.10 centimeters. From birth to the twenty-eighth week, the animals made an average gain of 2.59 centimeters in width of hip.

Milk consumption. Each animal received an average of 2,172 milliliters of milk during the first week, with an average increase of 336 milliliters in the second week. Each kid received no less than 2,000 milliliters of milk from the first to the eighth week, the average weekly consumption being 2,418.5 milliliters. From the ninth week, each kid received no less than 1,000 milliliters. The weekly consumption was on an average of 1,374.5 milliliters. The amount of milk each animal consumed for the first eight weeks was about two thirds of its total consumption during the entire 28 weeks of feeding. The greater consumption during the first weeks was due to the animals' principal dependence on milk for subsistence. In the following weeks when the animals got concentrate and roughage, less milk was given to them. The average consumption of each kid was 46,838 milliliters.

Concentrate consumption. Each kid consumed a daily average of 29.96 grams, 63.62 grams, 106.58 grams, 156.70 grams, 244.74 grams, 265.02 grams, and 313.48 grams of concentrate at the close of the 4th, 8th, 12th, 16th, 20th, 24th, and 28th week, respectively, or a weekly calculated consumption of 209.72 grams, 445.34 grams, 746.06 grams, 1,096.90 grams, 1,713.18 grams, 1,855.14 grams, and 2,194.36 grams during the same corresponding periods. The concentrate consumption tended to increase as the animal grew older, with an average calculated consumption of 28,758.59 grams (28.76 kilograms) for the entire feeding period. Of the 21 kids studied, 9 began to take in concentrate on the third week, 2 on the fourth week, and 5 on the fifth week. Three died before they had taken any amount of concentrate, while the last 2 kids included in the experiment had not started taking any at the end of the study. The animals consumed the ground corn and the copra meal first; they did not like much the fine rice bran.

Roughage consumption. Each kid consumed a daily average of 51.99 grams, 144.18 grams, 203.99 grams, 265.05 grams, 363.44 grams, 441.96 grams, and 511.06 grams of soilage at the close of the 4th, 8th, 12th, 16th, 20th, 24th, and 28th week, respectively, or a calculated weekly consumption of 363.93 grams, 1,009.26 grams, 1,427.93 grams, 1,855.35 grams, 2,544.08 grams, 3,093.72 grams, and 3,577.42 grams during the same corresponding periods. The quantity consumed increased as the animal grew older. The average calculated consumption for each kid during the entire feeding period was 49,550.27 grams (49.55 kilograms). Of the 21 kids, 10 began

to take in soilage on the third week, 5 on the fourth week, and one on the fifth week. The animals relished all forms of green feed given them.

Weaning age. The animal is considered weaned when it has already established its feeding habits and could live on roughage and concentrate and without milk in its ration. The weaning age of the kids that were raised artificially was twenty-eight weeks. It was necessary to provide milk to the kids even at this late age because the animals were recovering from parasitic infestation.

Mortality. In spite of the sanitary precautions taken, parasites (*Haemonchus contortus* Rudolphi) killed four of the kids when at an average age of three months. The animals were never allowed to go outside their pens; therefore, the parasites were possibly introduced through the roughage given. After the infestation was discovered, the infested kids were given immediate treatment, and green feed was gathered from untrodden places.

In spite of the care given, nine kids died of pneumonia on account of the inclement weather. Four of them were soaked wet during the typhoon "Jean" on December 26, 1947.

One of the kids succumbed to tetanus infection the morning following the day the ears were notched.

Only seven out of the twenty-one kids survived, thus registering 66.66 per cent mortality.

SUMMARY

1. Of the twenty-one kids in the experiment, twelve were males and nine were females.

2. The average milk consumption was 46,838 milliliters a kid for the 28 weeks of feeding. Cow's and goat's milk was given.

3. The kids began to take in concentrate and soilage from the third to the fifth week. The quantity consumed increased as the animal grew older, each kid making an average consumption of 28.76 kilograms of concentrate and 49.55 kilograms of soilage during the entire feeding period.

4. The growth and development of the artificially raised kids as determined by the weight, height at withers, heart girth, length of body, width of shoulder, and width of hip were most rapid during the early part of the experiment. From birth to the twenty-eighth week, the kids made an average increase in weight, height, heart girth, length of body, width of shoulder, and width of hip of 5.85 kilograms, 10.76 centimeters, 17.60 centimeters, 11.22 centimeters, 3.95 centimeters, and 2.59 centimeters, respectively.

5. The kids were weaned at the age of seven months.

6. The percentage of mortality was 66.66, the main causes of death being pneumonia and parasitic infestation.

7. Good feeding and care and proper sanitation and housing are necessary if motherless kids are to be raised successfully.

THE FLOOR SPACE REQUIREMENTS OF LAYERS RAISED IN BATTERY CAGES[1]

LEVY A. TRINIDAD

For ordinary laying houses, Carter and Foster[2] recommended a floor space of 3.2 to 4 square feet (0.297 sq. m. to 0.372 sq. m.) for each bird in large poultry houses, and of 3.33 to 4.44 square feet (0.309 sq. m. to 0.412 sq. m.) in small poultry houses. Standard individual laying cages now available in the market provide a floor space of approximately 40 centimeters square (1.31 feet square). No report is available on the floor area for each bird when layers are kept in groups of two or more to a cage. This study was made in the Department of Agricultural Engineering, in cooperation with the Department of Animal Husbandry, from November 15, 1949, to November 14, 1950, to determine the floor area that may be provided layers kept in groups for the most economical production of eggs.

MATERIALS AND METHODS

A total of 108 laying pullets, 54 New Hampshire and 54 Single Comb White Leghorn, were used. Each breed was housed in a three-story homemade battery cage measuring 4 feet x 6 feet x feet (1.22 m. x 1.83 m. x 1.83 m.). Each story had a floor area of 24 square feet (2.23 sq. m.). To keep track of the individual egg production, a unit of six trapnests was attached to each story. This cage was made of No. 6 copper wire, one-inch mesh hardware cloth, No. 16 wire, and wooden frames. The cages were placed in one wing of the Poultry Husbandry Building, where the birds received sunshine for about two hours daily.

The layers of each breed were divided in the different lots as follows:

LOT NO.	NO. OF LAYERS	FLOOR SPACE TO A BIRD
1	12	2 square feet (1858.06 sq. cm.)
2	18	1.33 square feet (1235.61 sq. cm.)
3	24	1 square foot (929.03 sq. cm.)

The floor assignment of each lot for the two breeds was determined at random. In both breeds lot 1 occupied the third story; lot 2, the second story; and lot 3, the first story.

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[1] Experiment Station Contribution No. 1606. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, April, 1951. Prepared in the Departments of Agricultural Engineering and Animal Husbandry under the direction of Assistant Professor Andres P. Aglibut and Professor F. M. Fronda.

[2] CARTER, DEANE G. AND W. A. FOSTER. 1947. Farm buildings. 3rd ed., vii + 404 p., 222 fig. New York: John Wiley & Sons, Inc.

The same ration was given dry to all lots. This ration consisted of 2 parts rice bran, 5 parts ground corn, 2 parts fish meal,[3] and 1 part copra meal, all parts by weight. One kilogram of common table salt was added to every 100 kilograms of the mash mixture. Finely ground shell, grit, and drinking water was accessible to the birds at all times. Chopped green feed was given at least three times a week.

The initial and monthly weights of all the birds were taken. The individual and total egg production, the amount of feed consumed, and the mortality among the birds in each lot were carefully recorded.

RESULTS AND DISCUSSION

Egg production. The percentage of egg production was determined by dividing the actual number of eggs laid within the period by the total possible number of eggs that may be produced by the lot, and multiplying the quotient by 100.

The best individual production among the New Hampshire birds were 240, 228, and 224 eggs, and the poorest were 119, 35, and 24 eggs for lots 1, 2, and 3, respectively (table 1a). The range of individual egg production of lot 1 was better than those of lots 2 and 3, and that of lot 2 was better than that of lot 3. In the case of the Single Comb White Leghorns, the individual egg production ranged from 225 to 162 in lot 1, from 203 to 34 eggs in lot 2, and from 215 to only 16 eggs in lot 3 (table 1b). Again, these figures show that the birds in lot 1 had a higher range of production than the birds of the other two lots. In both cases, the comparison may be unreliable because the eggs laid on the floor outside the trapnest were excluded from the individual records.

A better comparison of egg production in the different lots could be made by using the total production of each lot. With the New Hampshire layers, lot 1 produced a total of 1942 eggs during the year; lot 2, 1867 eggs; lot 3, 2145 eggs (table 1a). The Single Comb White Leghorns produced 2044, 2472, and 3133 eggs in lots 1, 2, and 3, respectively (table 1b). Thus, the average annual egg productions of the New Hampshire layers were 186.2 (51.3 per cent) in lot 1, 114.3 (31.3 per cent) in lot 2; and 125.9 (34.5 per cent) in lot 3. The Single Comb White Leghorn layers had an annual average egg production of 178.2 (48.8 per cent), 146.6 (40.2 per cent), and 155.1 (42.5 per cent) for the lots 1, 2, and 3, respectively. From the sixth month, the egg production in both breeds gradually decreased as a result of molting. More eggs were produced from December to April than in other months. This distribution of egg production followed the normal trend under local conditions.[4] These

[3] From March 2 to March 25, 1950, powdered skim milk was used instead of fish meal because no fish meal was available at the time.

[4] FRONDA, F. M. 1928. The seasonal distribution of egg production. Philippine Agriculturist 7: 25–36.

figures show that the birds in lot 1 of both breeds gave a higher individual annual egg production than either of the other two lots. There was no significant difference between the egg production of lot 2 and that of lot 3 of both breeds. Among the Single Comb White Leghorns, however, the individual egg production of the birds in lots 2 and 3 was higher than those of the corresponding lots among the New Hampshires. These results seem to indicate that the comparatively smaller Single Comb White Leghorn layers did not need as wide floor space as the New Hampshires. It is apparent, therefore, that for practical purposes the minimum floor space that may be allowed each Single Comb White Leghorn layer in a colony battery cage is less than the minimum floor space that may be allowed a New Hampshire layer.

Feed consumption and cost. The average amount of feed consumed by a bird was practically the same for all New Hampshire lots (table 2a). The average individual consumption in lot 1 was 34.82 kilograms, in lot 2, 33.29 kilograms, and in lot 3, 35.30 kilograms. A similar relationship was observed among the Single Comb White Leghorn lots (table 2b). Lot 1 consumed 32.99 kilograms of feed; lot 2, 32.70 kilograms; and lot 3, 32.05 kilograms. On the basis of the then current prices, the cost of feed consumed by each New Hampshire layer was ₱7.83 in lot 1, ₱7.49 in lot 2, and ₱7.93 in lot 3. Among the Single Comb White Leghorn layers, the cost of feed consumed by each bird was ₱7.42 in lot 1, ₱7.36 in lot 2, and ₱7.21 in lot 3. In both breeds there was no evident correlation between the floor area allotted to each layer and the average feed consumption.

A New Hampshire layer in lot 1 required 2.25 kilos of feed costing 51 centavos to produce one dozen eggs; in lot 2, 3.49 kilos costing 79 centavos; and in lot 3, 3.36 kilos costing 76 centavos (table 2a). A Single Comb White Leghorn layer in lot 1 required 2.22 kilos costing 50 centavos to produce one dozen eggs; lot 2, 2.67 kilos costing 60 centavos; and lot 3, 2.47 kilos costing 56 centavos (table 2b). On the basis of the amount of feed required to produce a dozen eggs, lot 1 of both breeds showed a better performance than the other two lots. The returns from the eggs produced above the feed cost for a New Hampshire layer were ₱20.10 in lot 1, ₱9.66 in lot 2, and ₱10.95 in lot 3. For the Single Comb White Leghorn lots, the corresponding figures were ₱19.31, ₱14.64, and ₱16.06. It is apparent that in both breeds the birds with the widest floor area gave the highest returns above the cost of feed. The returns from lots 2 and 3 were practically the same.

Weight of the birds. All the birds in the lots increased in weight (table 3). An analysis of the average monthly weights of the birds showed no definite trend in increase in weight. The differences between the average initial and final weights in both breeds were not significant, except in lot 1 of the Single Comb White Leghorns. The data seem to indicate that the amount of floor space allowed each layer had no influence on the weight of the birds.

Mortality. The first deaths among the New Hampshires occurred during the first month. The first mortality among the White Leghorns occurred during the fourth month of the study; the other deaths followed in the subsequent months. Among the New Hampshires, the mortality during the year was 24.99 per cent in lot 1, 33.10 per cent in lot 2, and 45.76 per cent in lot 3. Lot 3 of the Single Comb White Leghorn layers suffered the highest mortality of 29.12 per cent, compared to 16.65 per cent for lot 2, and only 8.33 per cent for lot 1. In both breeds the distribution of mortality was similar, that is, lowest in lot 1, intermediate in lot 2, and highest in lot 3. The differences between the percentages of mortality in the different lots may, therefore, be ascribed to the amount of floor space allotted to each bird. It may be concluded that the less the floor space allowed each layer, the higher the mortality.

SUMMARY

1. In both Single Comb White Leghorn and New Hampshire layers, the lots that were allowed a floor space of two square feet (1858.06 sq. cm.) each bird produced more eggs than those that were allowed either 1.33 square feet (1235.61 sq. cm.) or one square foot (929.03 sq. cm.) each.

2. There was no appreciable difference in the amounts of feed consumed by each bird in all the lots, but the amount and cost of feed necessary to produce a dozen eggs decreased as the floor space for each bird increased.

3. The floor area allowed each Single Comb White Leghorn or New Hampshire layer had no influence on the weight of the bird.

4. The rate of mortality increased as the amount of floor space for each layer decreased.

5. For the most economical production of eggs, 2 square feet of floor space (the maximum used in the experiment) for each layer raised in groups proved the best.

TABLE 1a

Distribution of egg production in the three lots of New Hampshire layers

PERIOD	LOT 1		LOT 2		LOT 3	
	Number of eggs laid	Percentage production	Number of eggs laid	Percentage production	Number of eggs laid	Percentage production
Nov. 15 to Dec. 14, 1949	175	48.6	185	34.2	251	33.9
Dec. 15 to Jan. 14, 1950	266	71.5	296	54.3	344	49.8
Jan. 15 to Feb. 14, 1950	247	66.4	258	48.9	305	46.8
Feb. 15 to Mar. 14, 1950	170	59.4	128	24.3	163	30.2
Mar. 15 to April 14, 1950	201	64.8	248	47.0	194	34.8
April 15 to May 14, 1950	154	51.0	159	30.2	158	32.8
May 15 to June 14, 1950	106	34.2	122	23.1	137	29.3
June 15 to July 14, 1950	142	45.8	137	26.4	153	34.5
July 15 to Aug. 14, 1950	185	59.7	143	30.2	155	36.0
Aug. 15 to Sept. 14, 1950	117	37.7	74	15.9	118	27.6
Sept. 15 to Oct. 14, 1950	91	31.9	67	16.5	88	21.3
Oct. 15 to Nov. 14, 1950	88	31.5	51	13.7	89	22.2
Total production for the year	1942	—	1867	—	2145	—
Annual egg production of each bird	186.2	—	114.3	—	125.9	—
Annual percentage production	—	51.3	—	31.3	—	34.5

TABLE 1b

Distribution of egg production in the three lots of Single Comb White Leghorn layers

PERIOD	LOT 1		LOT 2		LOT 3	
	Number of eggs laid	Percentage production	Number of eggs laid	Percentage production	Number of eggs laid	Percentage production
Nov. 15 to Dec. 14, 1949	191	51.3	239	39.9	287	39.9
Dec. 15 to Jan. 14, 1950	254	68.3	309	55.4	424	57.0
Jan. 15 to Feb. 14, 1950	273	73.4	290	52.0	441	59.3
Feb. 15 to Mar. 14, 1950	213	63.4	212	44.0	323	49.4
Mar. 15 to April 14, 1950	209	56.2	238	45.2	306	45.1
April 15 to May 14, 1950	157	46.4	219	42.9	277	45.0
May 15 to June 14, 1950	143	41.9	208	39.5	223	38.2
June 15 to July 14, 1950	100	30.3	228	44.7	270	50.0
July 15 to Aug. 14, 1950	159	46.2	222	42.4	214	38.3
Aug. 15, to Sept. 14, 1950	131	38.4	130	26.2	147	26.5
Sept. 15 to Oct. 14, 1950	127	38.5	97	21.4	142	31.5
Oct. 15 to Nov. 14, 1950	87	25.5	80	17.2	79	15.0
Total production for the year	2044	—	2472	—	3133	—
Annual egg production of each bird	178.2	—	146.6	—	155.1	—
Annual percentage production	—	48.8	—	40.2	—	42.5

TABLE 2a

Amount and cost of feed consumed and returns from eggs produced by New Hampshire layers

ITEMS	Lot 1	Lot 2	Lot 3
Total feed consumed, kilograms	363.40	543.60	601.90
Cost of total feed consumed, pesos [a]	81.76	122.21	135.43
Average feed consumed by each bird, kilograms	34.83	33.29	35.30
Cost of feed consumed by each bird, pesos	7.83	7.49	7.93
Total number of eggs produced	1942	1867	2145
Value of eggs produced, pesos [b]	291.30	280.05	321.75
Average annual production of each bird	186.22	114.35	125.89
Value of annual production of each bird, pesos	27.93	17.15	18.88
Returns above feed consumed by each bird, pesos	20.10	9.66	10.95
Returns above total feed consumed, pesos	209.54	157.84	186.32
Feed to produce one dozen eggs, kilograms	2.25	3.49	3.36
Cost of feed needed to produce a dozen eggs, pesos	.51	.79	.76

[a] A kilogram of the ration cost ₱0.225.
[b] Based on ₱1.80 a dozen.

TABLE 2b

Amount and cost of feed consumed and returns from eggs produced by Single Comb White Leghorn layers

ITEMS	Lot 1	Lot 2	Lot 3
Total feed consumed, kilograms	378.60	551.60	647.50
Cost of total feed consumed, pesos [a]	85.19	124.11	145.68
Average feed consumed by each bird, kilograms	32.99	32.70	32.05
Cost of feed consumed by each bird, pesos	7.42	7.36	7.21
Total number of eggs produced	2044	2472	3133
Value of eggs produced, pesos [b]	306.60	370.80	469.95
Average annual production of each bird	178.19	146.65	155.13
Value of annual production of each bird, pesos	26.73	22.00	23.27
Returns above feed consumed by each bird, pesos	19.31	14.64	16.06
Returns above total feed consumed, pesos	221.33	246.69	324.27
Feed to produce one dozen eggs, kilograms	2.22	2.67	2.47
Cost of feed needed to produce a dozen eggs, pesos	.50	.60	.56

[a] A kilogram of the ration cost ₱0.225.
[b] Based on ₱1.80 a dozen.

TABLE 3

Average monthly weights of Single Comb White Leghorn and New Hampshire layers

	BREEDS					
	Single Comb White Leghorn			New Hampshire		
	LOT 1	LOT 2	LOT 3	LOT 1	LOT 2	LOT 3
Number of birds at start	12	18	24	12	18	24
Average initial weight, kilograms	1.43	1.45	1.47	2.04	1.96	1.95
Number of birds at end of study	11	15	17	9	12	13
Average final weight, kilograms	1.60	1.66	1.76	2.49	2.25	2.15
Gain in weight, kilogram	.17	.21	.29	.45	.29	.20
Percentage gain in weight	11.89	14.48	19.72	22.06	14.80	10.26

COLLEGE AND ALUMNI NEWS

The students who qualified for scholarships for the first semester of the academic year 1951-52 and their grades are as follows: University scholarship, Ibarra S. Santos, 1.41; Pedro B. Escuro, 1.42; and Orlando J. Sacay, 1.44; College scholarship, Jose O. Juliano, 1.58. Only two of these students, Santos and Sacay, are awarded the scholarship, as the other two are Bailon-De la Rama scholars.

Mr. Rodrigo J. Guillermo was appointed instructor in agricultural chemistry, effective June 19, 1951. He graduated recently from the University of the Philippines with the degree of Bachelor of Science in Chemistry.

Mr. Jorge G. Davide, '51, was appointed assistant instructor in the Department of Soils, effective May 21, 1951.

Mr. Demetrio Santos, '36, was recently appointed executive officer of the Import Control Commission.

Mr. Juan I. Neric, '21, was appointed superintendent of instruction in the college department of the Central Luzon Agricultural College in Muñoz, Nueva Ecija.

Mr. Constantino Derecho, '27, was appointed principal of the secondary school department of the College, succeeding Mr. Neric.

Mr. Alfonso Eusebio, '44, resigned from this College effective July 1, 1951, to accept a position at the Central Luzon Agricultural College.

Mr. Guillermo Santos, '48, has been elected president of the Central Luzon Agricultural College (formerly C.L.A.S.) Alumni Association. The position makes him *ex-officio* member of the C.L.A.C. Board of Trustees.

Mr. Cesario C. Bandong, '29, sailed last July 13 for the United States, where he will pursue vocational education at the University of Minnesota. He was granted scholarship under the Fulbright and Smith-Mundt Acts. He was principal of the Torres High School in Manila at the time he was awarded the scholarship.

On June 23, 1951, abacá seedlings with distinct mottling symptoms characteristic of the mosaic disease, collected from the Abacá Experiment Station of the Bureau of Plant Industry at Guinobatan, Albay, were received in the Department of Plant Pathology from Mr. Avelino E. Bigornia, assistant entomologist, and Dr. Donald de Leon, foreign agricultural adviser to the Philippine Government.

Mr. Celestino Habito, '44, was granted a scholarship by the U. S. Department of State, and sailed for the United States on July 15. He will take industrial arts at the Iowa State College.

Miss Teresita L. Pronove, instructor in the Rural High School, went on an extended leave of absence because of failing health. She joined the University in 1947.

A regular scientific meeting of the Los Baños Biological Club was held on Friday afternoon, July 27, 1951, in the Agricultural Chemistry Lecture Hall. Professor Calixto Mabesa read a paper on the construction of an experimental dryer and on drying rattan canes.

A welcome party for the freshmen was held at the Seniors' Social Garden on July 14, under the auspices of the student body organization, of which Mr. Quirino Villaviza is the president.

A welcome program for newcomers was held on July 3 in the Rural High School. The program included talks by the principal, faculty members, and student officers; and songs and instrumental music rendered by students.

Major Victor Feliciano, '25, was recently appointed PC provincial commander for the province of Laguna.

Mr. Ignacio Ang, '32, of the Bureau of Soil Survey and Conservation, left for the United States as a government pensionado on mechanized farming. He will study at the University of California.

Dr. Deogracias Villadolid '19, director, Bureau of Fisheries, returned from a ten-day executive meeting of the Indo-Pacific Fishery council held at Singapore. He was accompanied by Mrs. Villadolid.

Mr. Cesar A. Villariba, '48, sailed for the United States to pursue advanced studies in vocational education at the New York University, as a pensionado of the Luzonian College in Lucena.

THE EXPERIMENT STATION

LIST OF AVAILABLE PUBLICATIONS

No. 2.—Bud Rot of Coconut ..... *By G. O. Ocfemia*

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The undersigned, business manager of THE PHILIPPINE AGRICULTURIST, published monthly, except April and May, in English at the College of Agriculture, College, Laguna, after having been duly sworn in accordance with law, hereby submits the following statement of ownership, management, circulation, etc., which is required by Act 2580, as amended by Commonwealth Act 201:

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J. M. CAPINPIN
Business Manager

Subscribed and sworn to before me this 5th day of March, 1952, at Los Baños, Laguna, the affiant exhibiting his Residence Certificate No. A-4298066, issued at Los Baños, Laguna, on January 2, 1952.

AURELIO C. ALMASAN
Municipal Mayor
Los Baños, Laguna